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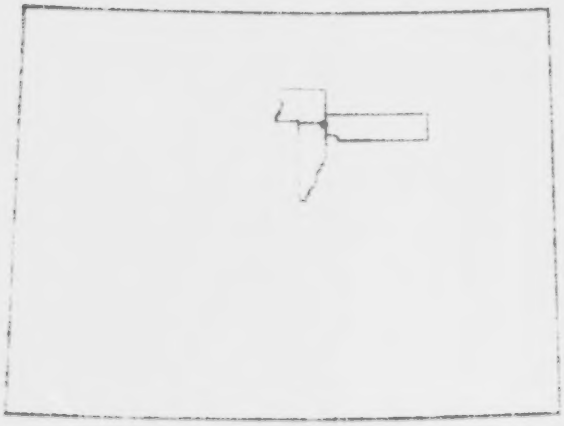
FLOOD INSURANCE STUDY

CITY OF
BROOMFIELD,
COLORADO
ADAMS, BOULDER, AND
JEFFERSON COUNTIES



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Federal Emergency Management Agency

COMMUNITY NUMBER - 085073

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study report revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the City of Broomfield, in Adams, Boulder, and Jefferson Counties, Colorado. This information will be used by Broomfield to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this revised study were performed by Greiner Engineering Sciences, Inc., Denver, Colorado, for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-83-C-11-73. This study was completed in March 1985.

1.3 Coordination

The initial coordination meeting was held in the City of Broomfield on April 26, 1983. This meeting, attended by representatives of the City of Broomfield, Colorado Water Conservation Board (CWCB), Urban Drainage and Flood Control District (UDFCD), and study contractor, was held to discuss the nature and purpose of the study and the scope and limits of work.

2.0 AREA STUDIED

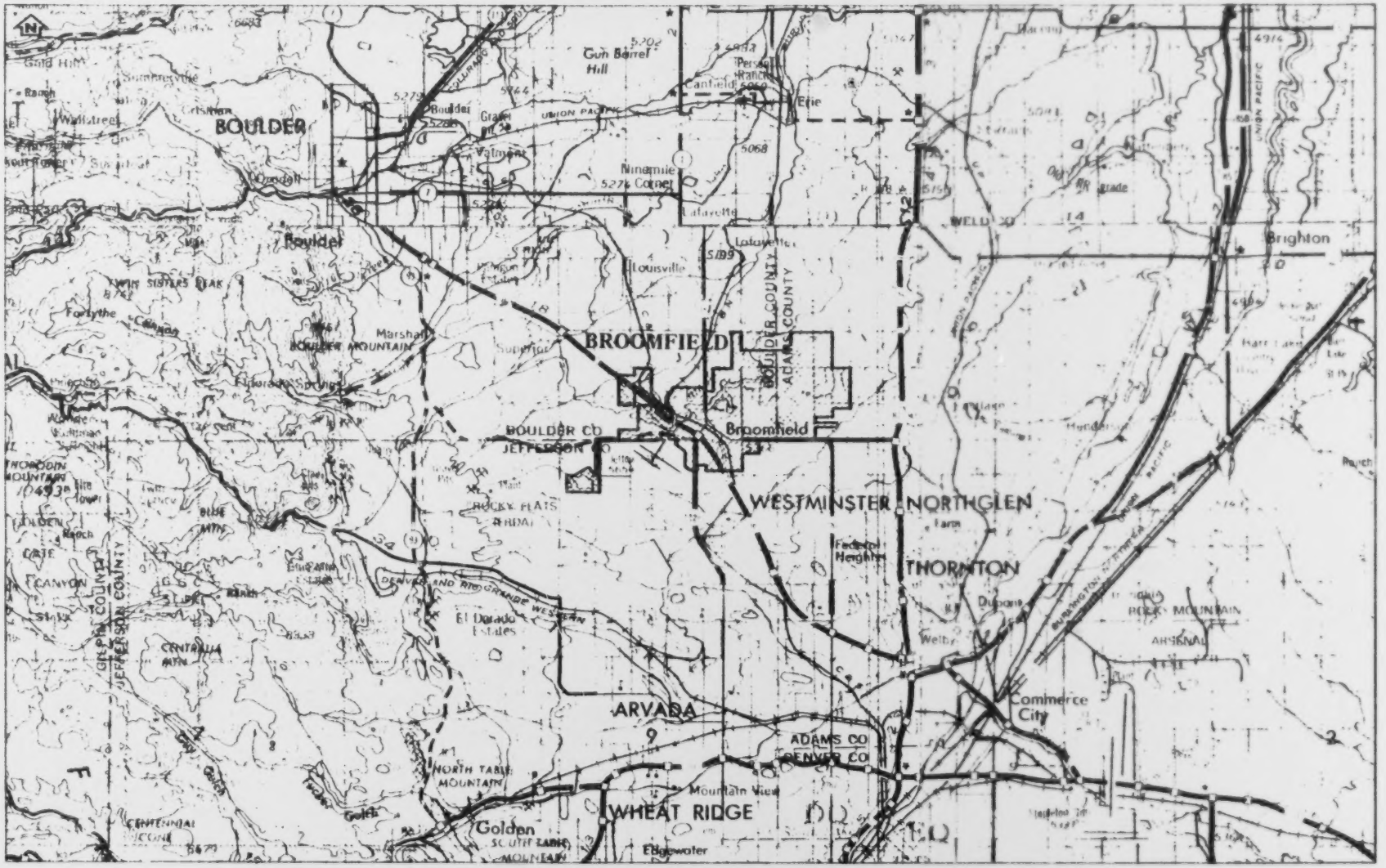
2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Broomfield, in Adams, Boulder, and Jefferson Counties, Colorado.

The area of study is shown on the Vicinity Map (Figure 1). The flooding sources and reaches studied by detailed methods are shown in Table 1.

Table 1. Detailed-Study Flooding Sources

Flooding Source	Reach Studied
Airport Creek	From Pierce Street to approximately 1,400 feet upstream of Wadsworth Parkway
Big Dry Creek	In the vicinity of the sewage disposal plant
Brandywine Creek	From Lowell Boulevard to West 124th Avenue
City Park Channel	From confluence with Nissen Reservoir Channel to approximately 1,650 feet upstream of Burbank Street
City Park Channel South Tributary	From Confluence with City Park Channel to U.S. Highway 287
Gay Reservoir Channel	From Le Gault Reservoir to confluence of West Lake Channel
Gay Reservoir Channel North Tributary	From confluence with Gay Reservoir Channel upstream to area not included (Adams County)
Nissen Reservoir Channel	From Lowell Boulevard to approximately 1,000 Feet upstream of Daphne Street
North Branch Airport Creek	From confluence With Airport Creek to approximately 900 feet west of Wadsworth Parkway
Rock Creek	From confluence with Coal Creek to Denver-Boulder Turnpike
West Lake Channel	From West 128th Avenue to approximately 2,250 feet east of Lowell Boulevard
West Lake Channel North Tributary	From confluence with West Lake to West 136th Avenue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Boulder
BROOMFIELD
Broomfield
BOULDER CO
JEFFERSON
WESTMINSTER
NORTHGLEN
THORNTON
ARVADA
WHEAT RIDGE
Golden
Edgewater
Mountain View
Commerce City
ADAMS CO
DENVER CO
Brighton
Louisville
Lafayette
Erie
Gun Barrel Hill
Ninemile Corner
Marshall
Federal Heights
Dupont
Welby
ROCKY MOUNTAIN ARSENAL
ROCKY FLATS AFB
BOULDER COUNTY
ADAMS COUNTY
JEFFERSON COUNTY
GILPIN COUNTY
WELD CO
DENVER AND RIO GRANDE WESTERN
UNION PACIFIC
NORTH TABLE MOUNTAIN
SOUTH TABLE MOUNTAIN
CENTENNIAL
CENTRALIA MTN
BLUE MTN
EL DORADO ESTATES
CANTRELL RANCH
PERSIGO RANCH
MARSHALL MOUNTAIN
BOULDER MOUNTAIN
TWIN SISTERS PEAK
FORSYTHE CANYON
GOLDEN GATE CANYON
GOLDEN GATE
GOLD HILL
SUMMERVILLE
WALLSTREET
VALMONT
CRISMAN
RALSTON
FLAGSTAFF SUMMIT
FLAGSTAFF MOUNTAIN
FLORISSA SPRINGS
ALTONA
SUPERIOR
HARRIS LAKE
LAKE
FARM
RANCH
GRADE
5272
5764
5068
5109
5279
5673
5202
5280
5274
5288
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The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through March 1990.

2.2 Community Description

The majority of Broomfield is located in Boulder County, although portions are situated in Adams and Jefferson Counties. Broomfield is located in north-central Colorado, on the eastern slope of the Rocky Mountains, approximately 13 miles north of Denver. In 1970, the population of Broomfield was 7,161; at the end of 1980, the population was 20,730 (Reference 1). Continued growth is expected for the City of Broomfield.

miles and are bounded on the northwest by a rise at an elevation of approximately 5,400 feet. The streams generally flow southeasterly, emptying into Big Dry Creek at an approximate elevation of 5,200 feet. The drainage boundaries of the individual basins are indistinct, being located at the crests of the east-west rolls of the high plains. The creeks are generally shallow, with no distinct channels.

The climate of the area has characteristic features of low relative humidity, low rainfall, moderate to high winds, and a large daily range in temperature. Temperatures range from a high of 102°F to a low of -26°F at Rocky Flats. The average maximum and minimum temperatures are 60.2°F and 39.1°F, respectively. The average annual precipitation at Rocky Flats is 15.14 inches. Sixty-nine percent of the precipitation occurs between April and September. Summer precipitation is largely from thunderstorm activity and is sometimes extremely heavy.

Typical area soils are composed mostly of the Nunn, Platner, and Renshill series, as defined by the U.S. Soil Conservation Service. These soils are generally well drained, nearly level to moderately sloping formations of loamy alluvial material. Slopes vary from 0 to 9 percent, and the natural vegetation is grass, although most undeveloped areas are cultivated. The permeability of these soils is moderate to slow (Reference 2).

Land use within the drainage basins consists of a mixture of commercial and residential development with several parks and open space areas.

2.3 Principal Flood Problems

The City Park Channel, located in southwestern Broomfield, is well defined and narrow until it crosses West 120th Avenue, where it becomes very shallow with low banks. The slope of this channel averages 47.6 feet per mile.

Nissen Channel flows southeasterly through central Broomfield and is narrow and relatively shallow. The average slope is 56.9 feet per mile. For approximately 1,400 feet, the stream flows down East 7th Avenue between Ash and Birch Streets. Runoff from West Lake and Gay Reservoir basins, located in northeastern Broomfield, flows through shallow, poorly defined channels that have average slopes of 68.3 feet per mile.

Flooding in Broomfield is generally caused by heavy local rainstorms. Flooding occurred in various parts of the city in June 1965, July 1965, and May 1973. Scenes of the May 1973 flood are shown in Figures 2 through 8.

2.4 Flood Protection Measures

The City has purchased various parcels to be developed into parks. In 1975, zoning ordinances were passed to prohibit construction of structures within the floodplains and to prevent flood damage.

Other flood protection measures include the construction of a levee and channel improvements along Gay Reservoir Channel.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood- plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

Figure 2. May 1973 Flooding at 10th Avenue and Sheridan Street

Figure 3. Runoff From Golf Course Detention Pond, 10th Avenue, Looking East

Figure 4. East 7th Avenue, Between Ash and Birch Streets, Looking East

Figure 5. Runoff From Golf Course Detention Pond

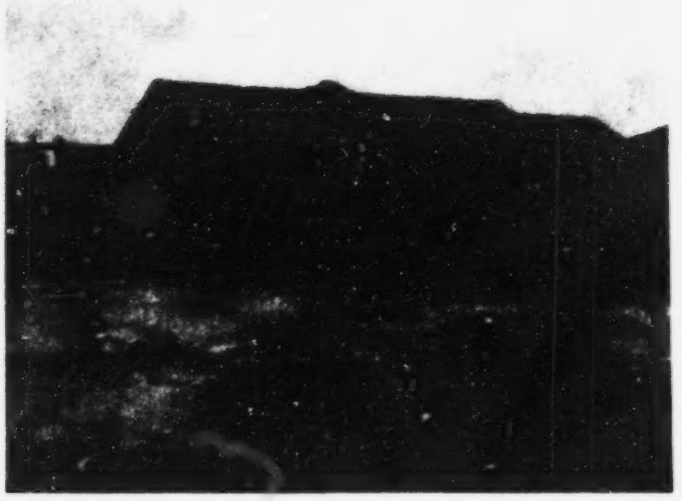


Figure 6. Northmoor, Corner of Elmwood and East 13th Avenues

Figure 7. Northmoor, 3rd Filing, American Homebuilders Area

Figure 8. 10th Avenue and Kohl Street, Looking West

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Peak discharges for the 10- and 100-year floods for the City Park, Nissen Reservoir, Gay Reservoir, and West Lake Basins were obtained from a 1979 UDFCD report (Reference 2). In the UDFCD report, the 10- and 100-year flood discharges were computed using the Storm Water Management computer model (Reference 3). The rainfall figure used was based on Volume III of the Precipitation-Frequency Atlas of the Western United States (Reference 4).

The study contractor determined the 50- and 500-year flood discharges by plotting the 10- and 100-year flood discharges on log-probability paper and interpolating or extrapolating as appropriate. The 50-year flood discharge was determined by interpolation; the 500-year flood discharge was determined from extrapolation.

Peak discharge-drainage area relationships for all flooding sources are shown in Table 2.

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Airport Creek					
At Confluence With Big Dry Creek	2.51	550	1,300	1,640	3,040
At Confluence With Tributary 1	1.22	370	760	920	1,540
At Upstream Limit of Detailed Study	0.43	390	690	810	1,220
North Branch Airport Creek					
At Confluence With Airport Creek	0.30	100	230	280	510
At Upstream Limit of Detailed Study	0.03	30	50	60	90
Rock Creek					
Confluence With Coal Creek	--[1]	5,120	8,740	10,640	15,920
At Dillon Road	--[1]	2,820	5,240	6,500	9,840
At Denver-Boulder Turnpike	--[1]	3,630	5,820	6,810	9,350

Table 2. Summary of Discharges (Cont'd)

Big Dry Creek At West 120th Avenue	41.2	4,900	8,700	10,200	12,000
Gay Reservoir Channel At Confluence With Big Dry Creek	2.60	915	1,525	1,820	2,650
Gay Reservoir Channel North Tributary Above Confluence With City Park Channel	--[1]	225	370	440	640
City Park Channel Upstream of Cross Section A	5.68	770	1,300	1,550	2,250
City Park Channel South Tributary Above Confluence With City Park Channel	--[1]	360	650	800	1,200
Nissen Reservoir Channel At Confluence With Big Cry Creek	2.67	1,860	3,150	3,400	5,600
West Lake Channel At Confluence With Gay Reservoir Channel	0.74	330	520	610	850
West Lake Channel North Tributary Above Confluence With West Lake Channel	--[1]	280	415	470	630
Brandywine Creek Confluence With Nissen Reservoir Channel	0.42	88	211	262	489

--[1]Data Not Available

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

For all streams studied by detailed methods, the water-surface elevations for floods of the selected recurrence intervals were computed using the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (Reference 5).

Cross sections used in the backwater analyses for all streams were obtained by aerial photogrammetry (Reference 6). The below-water sections of all cross sections were obtained by field measurement. All bridges, dams, and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness factors (Manning's "n") used in the hydraulic computations for the detailed study streams were chosen by engineering judgment and based on field observations. Roughness values for the main channels of the streams studied ranged from 0.02 to 0.065; overbank roughness values ranged from 0.02 to 0.10. Starting water-surface elevations for the Gay Reservoir Channel and City Park Channel were taken from stage-discharge relationships computed for Big Dry Creek for the Flood Insurance Study for Adams County (Reference 7). The starting water-surface elevations for Airport and Brandywine Creeks were computed using the elevations at their confluences with Big Dry Creek. The starting water-surface elevation for North Branch Airport Creek was determined at peak flow at its confluence with Airport Creek. For all other streams, the starting water-surface elevations were based on hand calculations at control sections.

The 100-year shallow flooding for City Park Channel along 120th Avenue, West Lake overflow near Grove Way, and Nissen Reservoir Channel near Tennyson Street was evaluated using manual hydraulic computations. Various sheetflow areas are present on many of the streams. The 100-year floodplain has been delineated to encompass all of these additional areas. The complete filling of these sheetflow areas will increase elevations downstream, thereby increasing the 100-year flood hazard. For any channel modification or fill in the sheetflow areas, a detailed review of the improvement should be undertaken to determine the effects downstream.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study produces maps designed to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2,400, with a contour interval of 2 feet (Reference 6).

The 100-year floodplain boundaries for the following streams were obtained from a 1979 UDFCD report (Reference 2):

City Park Channel
City Park Channel South Tributary
Gay Reservoir Channel
Gay Reservoir Channel North Tributary
Nissen Reservoir Channel
West Lake Channel
West Lake Channel Tributary

Additional 100-year floodplain boundaries on the Gay Reservoir Channel were obtained from individual consultant engineers.

The 500-year floodplain boundaries for each of these streams were delineated by the study contractor.

The floodplain boundaries for Big Dry Creek were obtained from the Flood Insurance Study for Adams County (Reference 7). The floodplain boundaries for Rock Creek were taken from a 1976 U.S. Soil Conservation Service report (Reference 8).

The 100- and 500-year floodplain boundaries are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100-and 500-year floodplain boundaries are close together, only the 100-year floodway boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the flooding sources studied by approximate methods, only the 100-year floodplain boundary is shown.

Approximate 100-year floodplain boundaries in some portions of the study are were taken directly from the Flood Insurance Rate Map for the City of Broomfield (Reference 9) and the Flood Insurance Study for Jefferson County, Colorado (Reference 10).

The approximate flooding in the vicinity of the sewage disposal plant was taken from the 1979 UDFCD report (Reference 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the floodplain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 3).

The floodways at the confluence of the Nissen Reservoir Channel and the City Park Channel incorporate sheetflow diversion areas common to both channels. The floodways were delineated through these sheetflow areas after analyzing two HEC-2 computer runs: (1) with the total flow confined to the channels, and (2) with partial flow confined to the channel. If the change in water-surface elevation between these computer runs was greater

than allowable with encroachment (i.e., greater than 1.0 feet), then the floodway was shown routed through the sheetflow diversion areas.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 9.

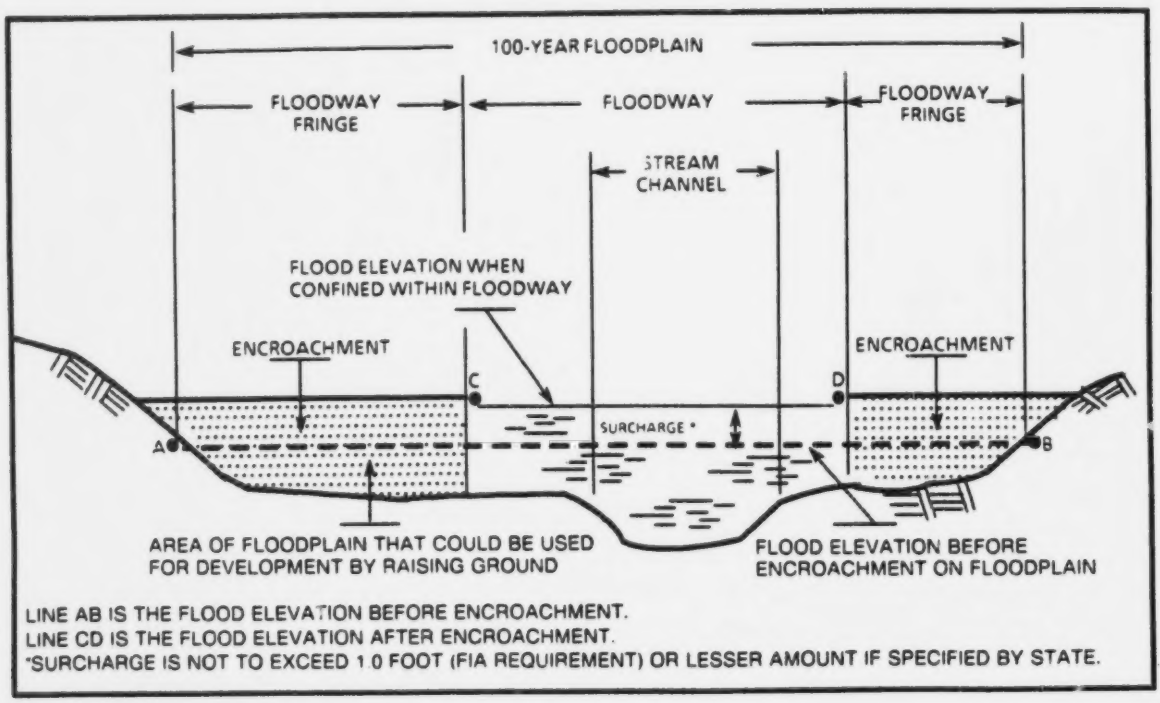

100-YEAR FLOODPLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE *
AREA OF FLOODPLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOODPLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 9. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Airport Creek								
A	7,400	129	636	2.1	5,333.1	5,333.1	5,333.1	0.0
B	8,000	160	340	3.9	5,334.2	5,334.2	5,335.0	0.8
C	9,965	150	1470	0.9	5,370.9	5,370.9	5,370.9	0.0
D	10,300	250	584	2.2	5,371.0	5,371.0	5,371.2	0.2
E	10,450	250	844	1.5	5,371.0	5,371.0	5,371.3	0.3
F	10,550	230	251	5.0	5,371.6	5,371.6	5,371.8	0.2
G	12,060	300	1298	0.9	5,393.5	5,393.5	5,393.9	0.4
H	13,150	234	192	4.4	5,410.2	5,410.2	5,410.2	0.0
I	14,160	145	187	4.5	5,429.6	5,429.6	5,429.7	0.1
J	15,500	272	3839	0.2	5,478.1	5,478.1	5,478.1	0.0
K	16,200	79	181	4.5	5,479.7	5,479.7	5,479.8	0.1
L	16,850	51	101	8.1	5,496.2	5,496.2	5,496.2	0.0

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

AIRPORT CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
North Branch Airport Creek								
A	800	123	68	3.3	5,414.4	5,414.4	5,414.5	0.1
B	3,550	41	29	4.8	5,503.2	5,503.2	5,503.2	0.0
C	3,880	112	476	0.3	5,512.3	5,512.3	5,512.3	0.0
D	4,62[illegible]	23	20	5.4	5,540.4	5,540.4	5,540.4	0.0

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

NORTH BRANCH AIRPORT CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Big Dry Creek								
A	113,460	495[2]	2737	4.0	5193.8	5193.8	5193.9	0.1
B	115,010	659[2]	2796	3.9	5196.5	5196.5	5196.7	0.2

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

BIG DRY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Gay Reservoir Channel								
A	4,680	82	211	5.7	5,218.7	5,218.7	5,218.8	0.1
B	5,070	75	187	6.5	5,220.8	5,220.8	5,220.8	0.0
C	6,020	164	195	6.2	5,235.9	5,235.9	5,236.8	0.9
D	7,080	162	229	4.6	5,249.9	5,249.9	5,250.3	0.4
E	7,805	1,042	4,582	0.2	5,262.9	5,262.9	5,262.9	0.0
F	8,845	200	183	5.2	5,264.7	5,264.7	5,265.2	0.5
G	9,270	194	315	3.0	5,268.9	5,268.9	5,269.8	0.9
H	9,780	51	113	8.5	5,275.2	5,275.2	5,275.5	0.3
I	10,280	59	168	4.9	5,281.4	5,281.4	5,282.3	0.9
J	10,820	20	44	8.4	5,287.6	5,287.6	5,288.0	0.4
K	11,355	56	103	3.6	5,294.4	5,294.4	5,294.7	0.3

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

GAY RESERVOIR CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Gay Reservoir Channel North Tributary								
A	960	138	171	2.6	5,297.4	5,297.4	5,297.5	0.1
B	1,405	213	108	4.1	5,304.9	5,304.9	5,304.9	0.0
C	1,800	252	145	3.0	5,315.1	5,315.1	5,315.1	0.0
D	2,160	94	93	4.7	5,321.9	5,321.9	5,321.9	0.0

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

GAY RESERVOIR CHANNEL NORTH TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
City Park Channel								
A	6,965	91	235	6.6	5,296.3	5,296.3	5,296.3	0.0
B	7,410	166	381	4.1	5,299.6	5,299.6	5,300.5	0.9
C	8,120	216	346	4.5	5,304.2	5,304.2	5,304.2	0.0
D	8,680	129	308	4.9	5,308.5	5,308.5	5,309.3	0.8
E	9,120	102	262	5.7	5,311.9	5,311.9	5,312.7	0.8
F	9,790	241	317	4.7	5,318.2	5,318.2	5,319.1	0.9
G	10,200	270	467	3.2	5,321.6	5,321.6	5,321.9	0.3
H	10,480	196	239	6.3	5,323.8	5,323.8	5,324.1	0.3
I	11,010	82	225	6.7	5,329.0	5,329.0	5,329.7	0.7
J	11,410	120	229	6.6	5,333.6	5,333.6	5,333.6	0.0
K	11,530	172	172	8.7	5,335.3	5,335.3	5,335.3	0.0
L	12,040	76	307	4.9	5,338.0	5,338.0	5,338.4	0.4
M	12,540	61	159	9.4	5,341.6	5,341.6	5,341.6	0.0
N	12,970	89	232	6.5	5,346.1	5,346.1	5,346.3	0.2
O	13,080	82	323	4.6	5,347.2	5,347.2	5,347.2	0.0
P	13,280	111	426	3.2	5,347.4	5,347.4	5,347.5	0.1
Q	13,800	61	151	9.1	5,350.0	5,350.0	5,350.0	0.0
R	14,220	85	196	7.0	5,355.4	5,355.4	5,355.4	0.0
S	15,180	68	131	6.8	5,362.1	5,362.1	5,362.3	0.2
T	15,670	58	149	6.0	5,366.4	5,366.4	5,367.1	0.7
U	16,170	47	113	7.9	5,371.1	5,371.1	5,371.7	0.6
V	16,660	44	104	8.6	5,379.5	5,379.5	5,379.9	0.4
W	16,995	212	206	4.3	5,387.6	5,387.6	5,388.1	0.5

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

CITY PARK CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
City Park Channel (Cont'd)								
X	17,225	104	402	2.2	5,390.3	5,390.3	5,390.4	0.1
Y	17,715	120	79	4.6	5,392.9	5,392.9	5,329.9	0.0
Z	18,210	96	162	2.2	5,398.5	5,398.5	5,398.5	0.0
AA	18,630	134	110	3.3	5,402.7	5,402.7	5,402.7	0.0
AB	19,210	45	110	3.3	5,407.5	5,407.5	5,408.1	0.6
AC	19,480	48	92	4.0	5,409.4	5,409.4	5,410.1	0.7
AD	20,000	172	188	1.9	5,414.2	5,414.2	5,414.2	0.0

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

CITY PARK CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Nissen Reservoir Channel								
A	2,640	155	603	6.3	5,239.2	5,239.2	5,239.2	0.0
B	3,072	105	262	7.1	5,242.7	5,242.7	5,242.9	0.2
C	3,372	94	682	2.7	5,245.0	5,245.0	5,245.4	0.4
D	3,645	88	356	5.2	5,247.0	5,247.0	5,247.0	0.0
E	3,775	92	551	3.4	5,248.4	5,248.4	5,249.2	0.8
F	4,720	249	306	6.1	5,260.1	5,260.1	5,260.6	0.5
G	5,142	74	331	5.6	5,264.7	5,264.7	5,265.2	0.5
H	5,432	75	294	6.3	5,266.7	5,266.7	5,267.1	0.4
I	6,140	216	525	3.5	5,272.4	5,272.4	5,273.2	0.8
J	6,655	203	281	6.6	5,278.0	5,278.0	5,278.1	0.1
K	7,160	187	485	3.8	5,282.7	5,282.7	5,283.6	0.9
L	7,660	102	250	7.4	5,287.0	5,287.0	5,287.4	0.4
M	8,080	179	433	4.3	5,290.0	5,290.0	5,290.8	0.8
N	9,840	154	422	3.4	5,302.0	5,302.0	5,302.3	0.3
O	10,110	151	761	1.9	5,303.9	5,303.9	5,304.9	1.0
P	10,420	160	674	2.2	5,304.0	5,304.0	5,304.9	0.9
Q	10,700	143	458	3.1	5,304.2	5,304.2	5,305.1	0.9
R	10,970	139	370	3.8	5,304.8	5,304.8	5,305.3	0.5
S	11,020	92	177	8.0	5,310.4	5,310.4	5,310.4	0.0
T	11,440	300	254	4.9	5,312.1	5,312.1	5,312.4	0.3
U	11,870	300	278	4.5	5,317.2	5,317.2	5,317.6	0.4
V	12,370	76	295	3.7	5,324.3	5,324.3	5,324.3	0.0
W	13,220	505	167	6.5	5,335.3	5,335.3	5,335.3	0.0

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

NISSEN RESERVOIR CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Nissen Reservoir Channel (Cont'd)								
X	13,925	194	194	5.6	5,337.5	5,337.5	5,337.5	0.0
Y	14,230	300	1,011	1.1	5,342.8	5,342.8	5,342.8	0.0
Z	14,700	226	203	5.4	5,349.9	5,349.9	5,349.9	0.0
AA	15,650	313	163	4.1	5,362.1	5,362.1	5,362.1	0.0
AB	15,960	197	234	2.9	5,364.8	5,364.8	5,364.9	0.1
AC	16,880	140	87	4.6	5,375.8	5,375.8	5,375.8	0.0
AD	17,310	22	47	8.5	5,382.1	5,382.1	5,382.1	0.0
AE	17,510	161	320	1.3	5,384.8	5,384.8	5,385.8	1.0
AF	18,050	37	61	6.5	5,388.4	5,388.4	5,388.6	0.2

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

NISSEN RESERVOIR CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
West Lake Channel North Tributary								
A	15[1]	20	34	4.5	5,265.2	5,265.2	5,265.7	0.5
B	500[1]	42	35	4.3	5,274.9	5,274.9	5,274.9	0.0
West Lake Channel								
A	320[2]	455	296	2.1	5,217.4	5,217.4	5,217.4	0.0
B	1,440[2]	288	138	4.0	5,219.9	5,219.9	5,219.9	0.0
C	1,690[2]	195	191	2.9	5,225.2	5,225.2	5,225.3	0.1
D	1,870[2]	196	115	4.8	5,227.8	5,227.8	5,228.5	0.7
E	2,485[2]	35	55	7.1	5,235.6	5,235.6	5,235.8	0.2
F	2,740[2]	35	80	4.9	5,236.7	5,236.7	5,237.1	0.4
G	3,010[2]	46	60	6.5	5,238.3	5,238.3	5,238.3	0.0
H	3,225[2]	84	73	5.3	5,242.8	5,242.8	5,242.8	0.0
I	3,940[2]	208	151	7.6	5,253.2	5,253.2	5,253.2	0.0
J	4,045[2]	134	93	5.0	5,264.8	5,264.8	5,265.5	0.7
K	6,050[2]	440	1,158	0.3	5,267.6	5,267.6	5,267.6	0.0
L	6,565[2]	56	52	5.5	5,273.0	5,273.0	5,273.0	0.0
M	7,100[2]	150	127	2.3	5,281.1	5,281.1	5,281.1	0.0
N	7,610[2]	120	68	4.3	5,289.3	5,289.3	5,289.4	0.1
O	8,095[2]	143	112	2.6	5,296.2	5,296.2	5,296.5	0.3

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

WEST LAKE CHANNEL NORTH TRIBUTARY-
WEST LAKE CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
City Park Channel South Tributary								
A	1,265	73	113	7.1	5,363.6	5,363.6	5,363.6	0.0
B	2,270	74	101	6.4	5,377.0	5,377.0	5,377.0	0.0
C	2,780	174	128	5.0	5,386.3	5,386.3	5,386.3	0.0
D	3,620	97	106	6.0	5,395.4	5,395.4	5,395.6	0.2
E	3,780	110	111	5.8	5,398.4	5,398.4	5,398.4	0.0
F	3,900	135	119	5.4	5,401.8	5,401.8	5,402.2	0.4

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

CITY PARK CHANNEL
SOUTH TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE[3]
					(FEET NGVD)			
Brandywine Creek								
A	850	13	106	2.5	5,239.7	5,239.7	5,240.7	1.0
B	890	31	210	1.2	5,239.8	5,239.8	5,240.8	1.0
C	1,630	77	322	0.8	5,239.9	5,239.9	5,240.8	0.9
D	2,230	584	4,217	0.1	5,239.9	5,239.9	5,240.8	0.9

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOODWAY DATA

BRANDYWINE CREEK

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied by detailed methods affecting the City of Broomfield.

5.1 Reach Determinations

Reaches are defined as sections of floodplain that have relatively the same flood hazard. In riverine areas, reaches are based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the riverine flooding sources of Broomfield are shown on the Flood Profiles (Exhibit 1), and the reaches are summarized in Table 4.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest one-half foot, multiplied by 10, and shown as a three digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10-and 100-year flood water-surface elevations is greater than 10.0 feet, it is rounded to the nearest whole foot.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100 - YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10 - YEAR)	2% (50 - YEAR)	0.2% (500 - YEAR)			
Airport Creek							
Reach 1	0220	-2.1	-0.6	1.1	020	A4	Varies - See Map
Reach 2	0220	-1.3	-0.3	1.1	015	A3	Varies - See Map
Reach 3	0220	-5.6	-1.7	5.5	055	A11	Varies - See Map
Reach 4	0220	-3.5	-1.8	5.7	035	A7	Varies - See Map
Reach 5	0220	-1.7	-1.4	5.7	020	A4	Varies - See Map
Reach 6	0215,0220	-0.4	-0.1	0.81	005	A1	Varies - See Map
Shallow Flooding	0215	N/A	N/A	N/A	N/A	AH	Varies - See Map
North Branch Airport Creek							
Reach 1	0215	-0.7	-0.4	0.4	005	A1	Varies - See Map
Rock Creek							
Reach 1	0215	-1.5	-0.9	0.7	015	A3	Varies - See Map
Reach 2	0215	-3.1	-0.7	0.8	030	A6	Varies - See Map
Big Dry Creek							
Reach 1	0220	-1.9	N/A	0.5	020	A4	Varies - See Map
Gay Reservoir Channel							
Reach 1	0220	-0.5	-0.1	0.3	005	A1	Varies - See Map
Gay Reservoir Channel North Tributary							
Reach 1	0220	-0.3	-0.1	0.4	005	A1	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOOD INSURANCE ZONE DATA

AIRPORT CREEK-NORTH BRANCH AIRPORT CREEK-ROCK CREEK-
BIG DRY CREEK-GAY RESERVOIR CHANNEL-GAY
RESERVOIR CHANNEL NORTH TRIBUTARY

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100 - YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10 - YEAR)	2% (50 - YEAR)	0.2% (500 - YEAR)			
City Park Channel							
Reach 1	0220	-0.7	-0.2	0.3	005	A1	Varies - See Map
Reach 2	0220	-1.4	-0.3	0.6	015	A3	Varies - See Map
Reach 3	0215,0220	-0.6	-0.2	0.4	005	A1	Varies - See Map
Shallow Flooding	0220	N/A	N/A	N/A	N/A	AH	Varies - See Map
Nissen Reservoir Channel							
Reach 1	0215,0220	-0.7	-0.2	0.4	005	A1	Varies - See Map
Shallow Flooding	0220	N/A	N/A	N/A	N/A	AH	5272
West Lake Channel North Tributary							
Reach 1	0220	-0.3	-0.1	0.2	005	A1	Varies - See Map
West Lake Channel							
Reach 1	0220	-0.3	-0.1	0.2	005	A1	Varies - See Map
Shallow Flooding	0220	N/A	N/A	N/A	N/A	AH	Varies - See Map
City Park Channel South Tributary							
Reach 1	0215,0220	-0.6	-0.2	0.4	005	A1	Varies - See Map
Brandywine Creek							
Reach 1	0220	-3.7	-2.7	2.0	035	A7	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER, AND JEFFERSON COS)

FLOOD INSURANCE ZONE DATA

CITY PARK CHANNEL-NISSEN RESERVOIR CHANNEL-WEST LAKE CHANNEL NORTH TRIBUTARY-WEST LAKE CHANNEL-CITY PARK CHANNEL SOUTH TRIBUTARY-BRANDY WINE CREEK

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zone AH:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; base flood elevations are shown, but no FHFs are determined.
Zones A1, A3, A4, A6, A7, and A11:	Special Flood Hazard Areas inundated by the 100-year flood; with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other local water-control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flood hazard; not subdivided.

The flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied by detailed methods in the community are summarized in Table 4.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Broomfield is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines show the locations of the expected whole-foot water-surface elevation of the base (100-year) flood. The base flood elevations and zone

numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the NFIP.

6.0 OTHER STUDIES

A Major Drainageway Plan for the Cities of Broomfield and Westminster was published in November 1979 (Reference 15).

Flood Insurance Studies have been prepared for the City of Louisville (Reference 12), Jefferson County (Reference 10) and Adams County (Reference 7). The results of those studies are in general agreement with the results of this study.

A Flood Hazard Boundary Map has been prepared for the City of Westminster (Reference 13) and is in agreement with this study.

A revised Flood Insurance Study is in progress for Boulder County (Reference 14); the results of that study will agree with the results of this study.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Denver Federal Center, Building 710, Box 25267, Denver, Colorado 80225-0267.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population and Housing, March 1981

2. Urban Drainage and Flood Control District, Flood Hazard Area Delineation-Broomfield Area, June 1979.

3. U.S. Environmental Protection Agency, Storm Water Management Model, August 1982

4. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Atlas 2, Precipitation-Frequency Atlas of the Western United States, Volume III, Colorado, 1973

5. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, 1976.

6. Delta Aerial Surveys, Inc., Topographic and Planimetric Maps, Scale 1:2,400, Contour Interval 2 feet, 1976

7. Federal Emergency Management Agency, Flood Insurance Study, Adams County, Colorado (Unincorporated Areas), February 1, 1979

8. U.S. Department of Agriculture, Soil Conservation Service, Flood Hazard Analyses, Coal and Rock Creeks, Boulder and Weld Counties, Colorado, October 1976

9. Federal Emergency Management Agency, Flood Insurance Rate Map, City of Broomfield, Colorado, December 14, 1982

10. Federal Emergency Management Agency, Flood Insurance Study, Jefferson County, Colorado (Unincorporated Areas), August 5, 1986

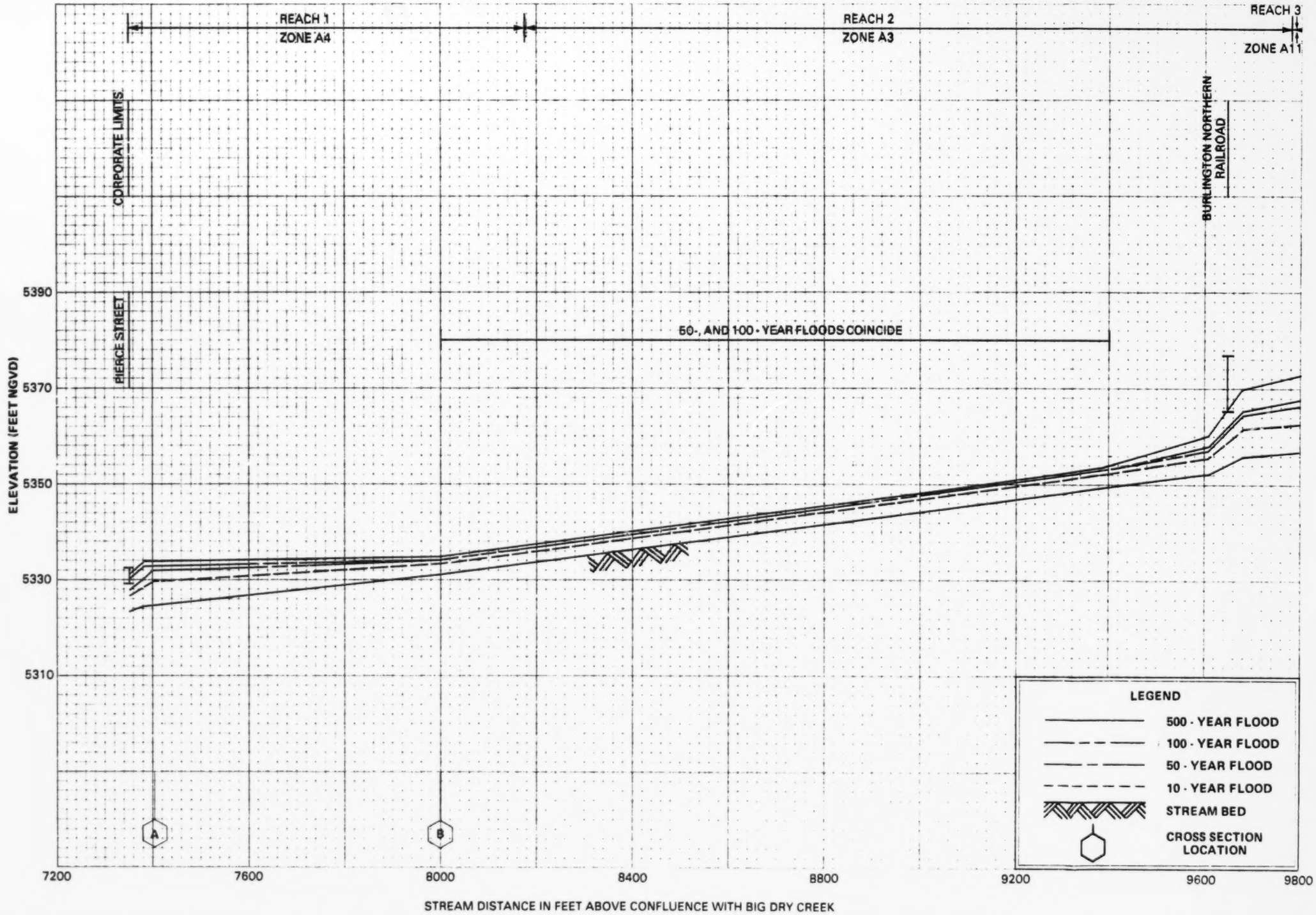
11. U.S. Department of Interior, Geological Survey, Flood Insurance Study, City of Broomfield, Colorado, June 1973

12. Federal Emergency Management Agency, Flood Insurance Study, City of Louisville, Colorado, January 5, 1982

13. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Westminster, Colorado, Scale 1:12,000, April 23, 1976

14. Federal Emergency Management Agency, Flood Insurance Study, Boulder County, Colorado (Unincorporated Areas), unpublished

15. Urban Drainage and Flood Control District, Major Drainageway Plan, Cities of Broomfield and Westminster, Colorado, Phase B, Direct Flow Area 3207, November 1979



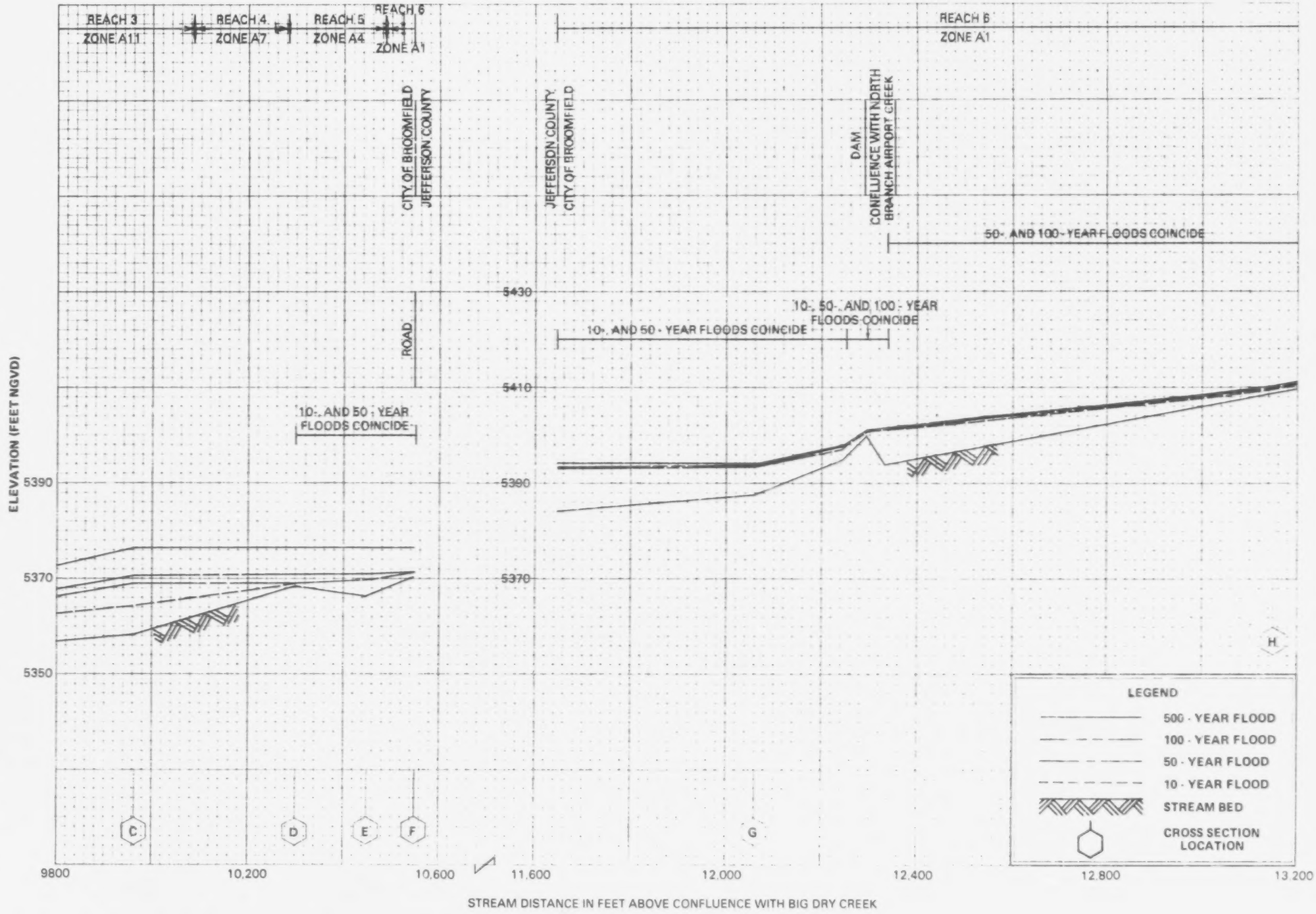
FLOOD PROFILES

AIRPORT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

01P



FLOOD PROFILES

AIRPORT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

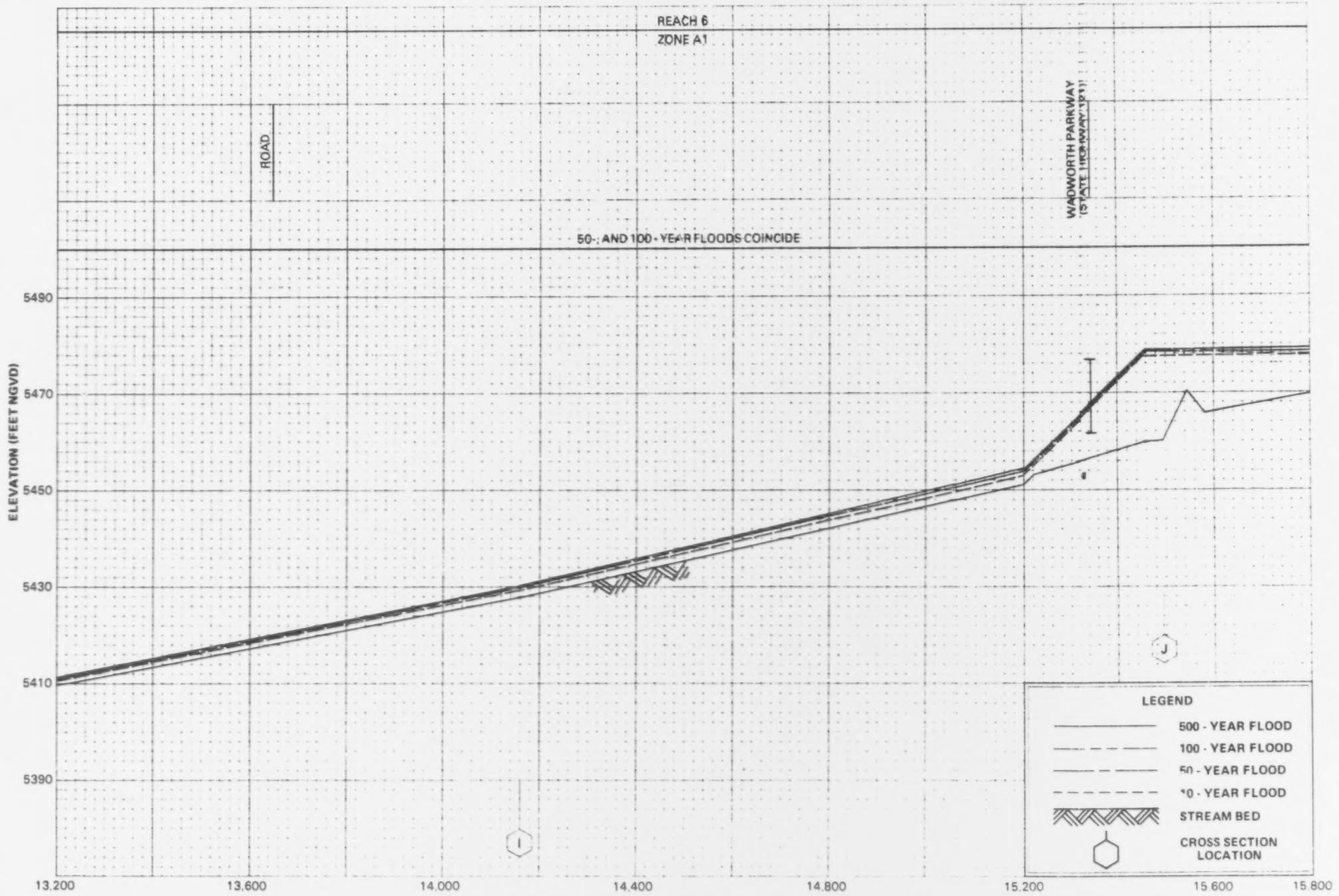
02P

REACH 6
ZONE A1

ROAD

WADWORTH PARKWAY
(STATE HIGHWAY 121)

50-; AND 100-YEAR FLOODS COINCIDE



STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH BIG DRY CREEK

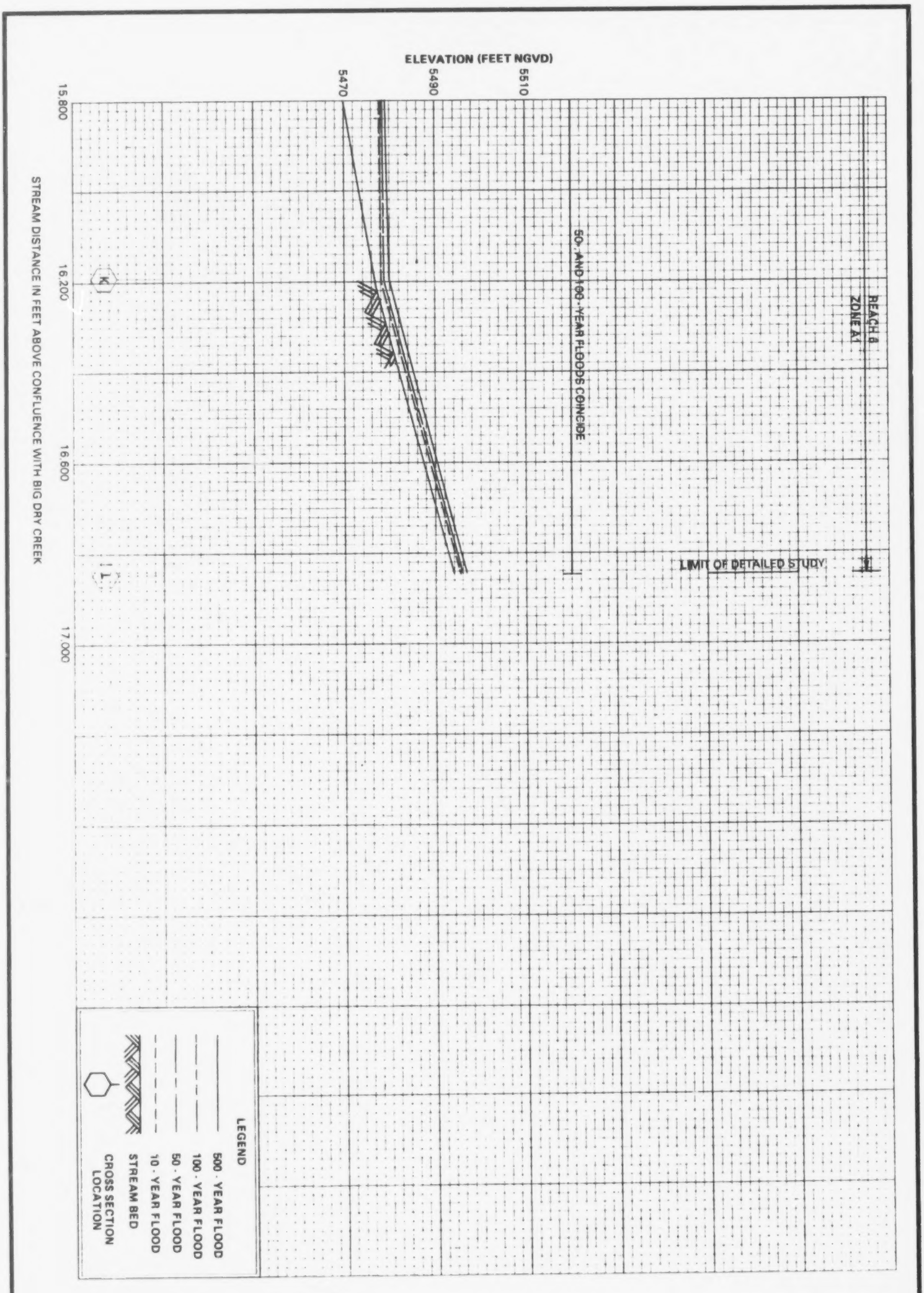
FLOOD PROFILES

AIRPORT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

03P



37

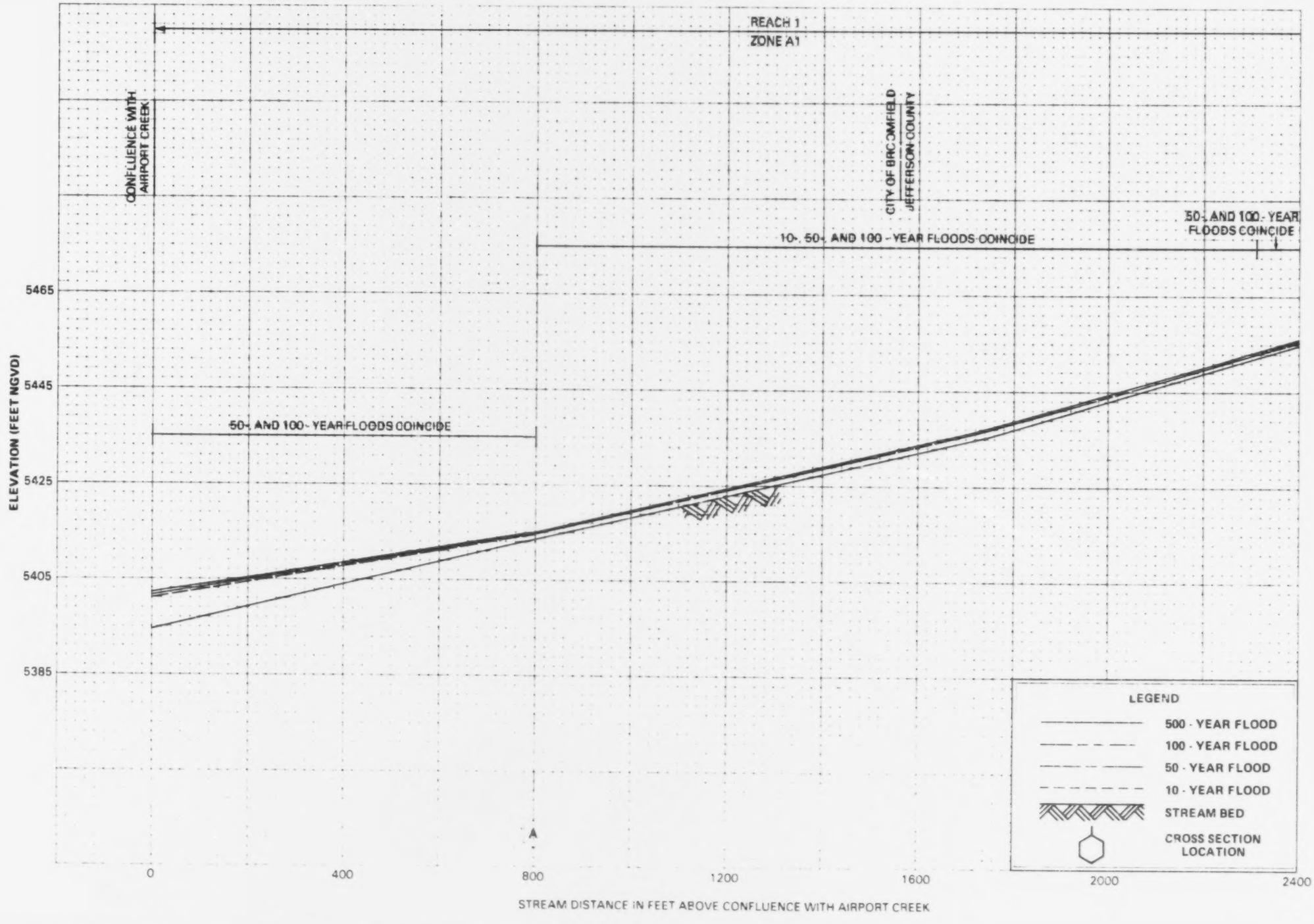
04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

FLOOD PROFILES

AIRPORT CREEK



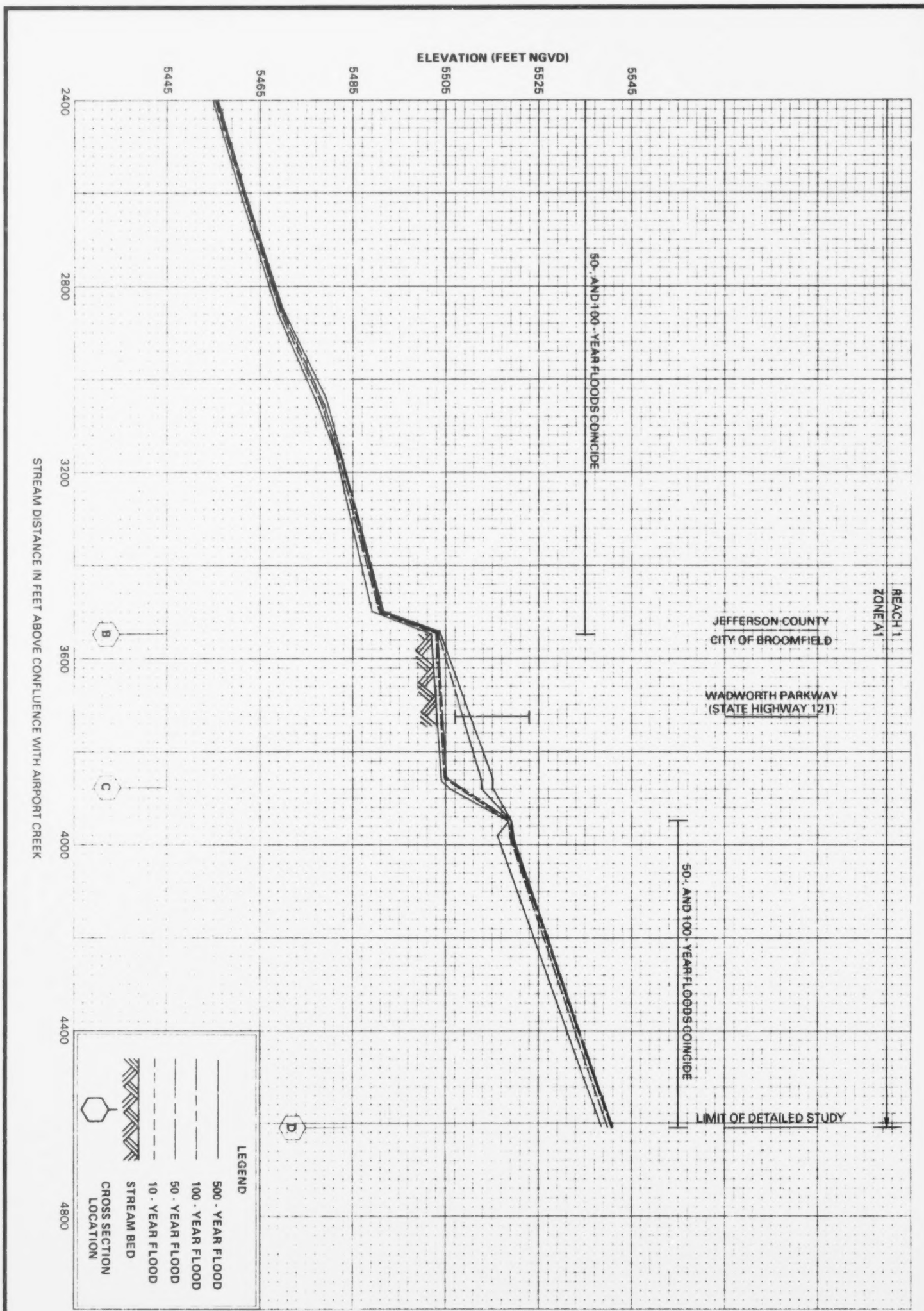
FLOOD PROFILES

NORTH BRANCH AIRPORT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

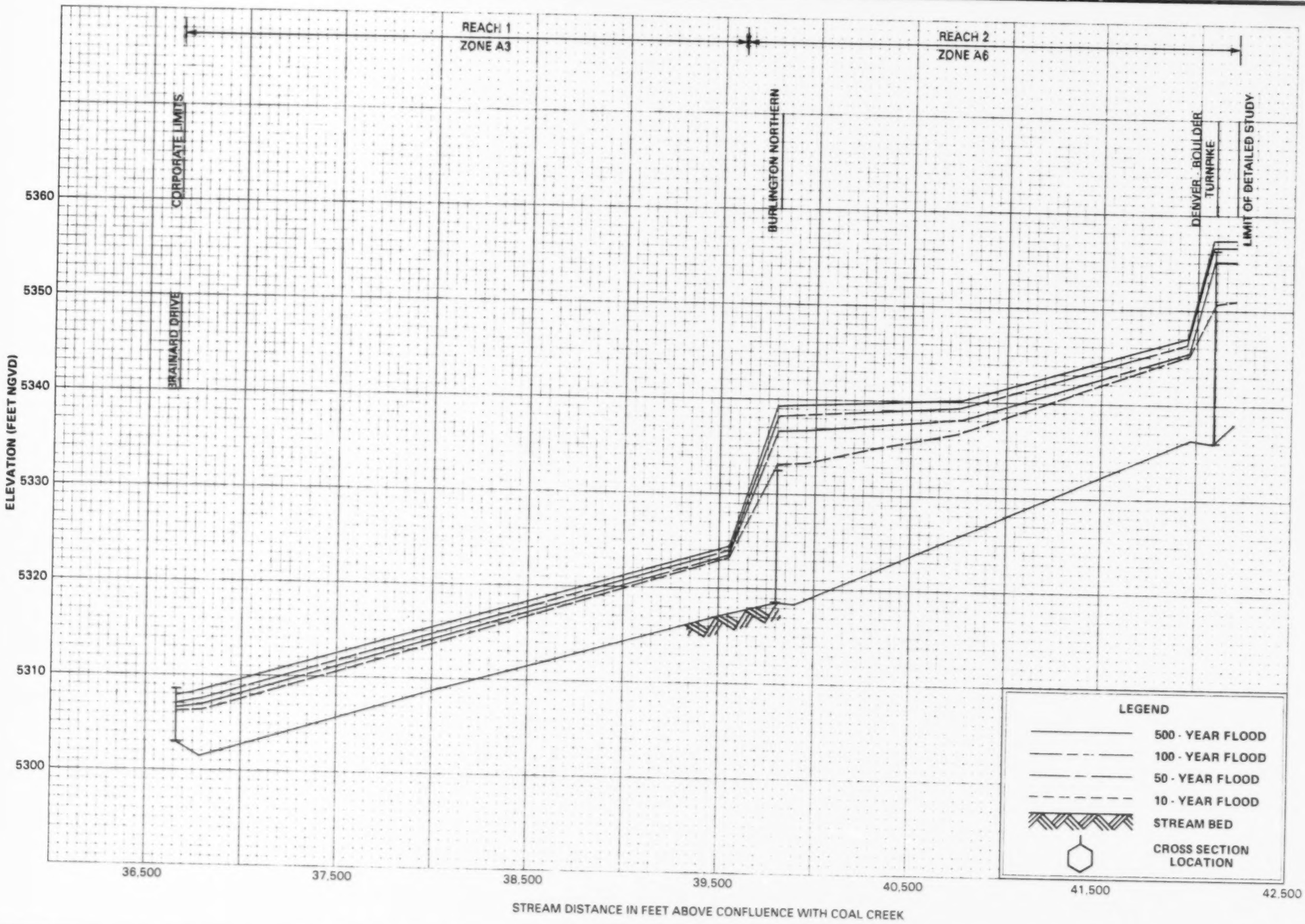
CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

05P



39

06P	FEDERAL EMERGENCY MANAGEMENT AGENCY CITY OF BROOMFIELD, CO (ADAMS, BOULDER AND JEFFERSON COS.)	**FLOOD PROFILES** NORTH BRANCH AIRPORT CREEK



FLOOD PROFILES

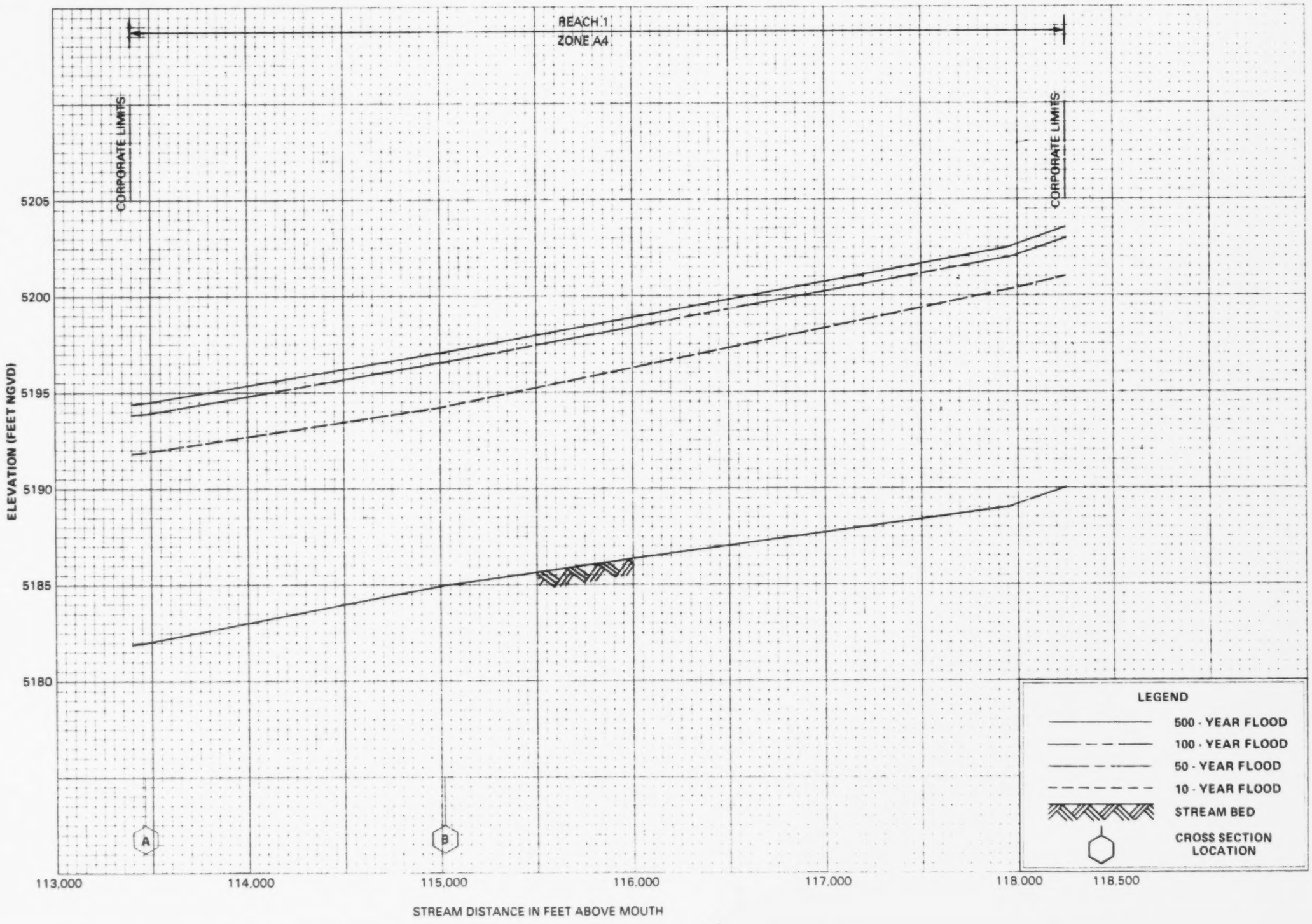
ROCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

07P



FLOOD PROFILES

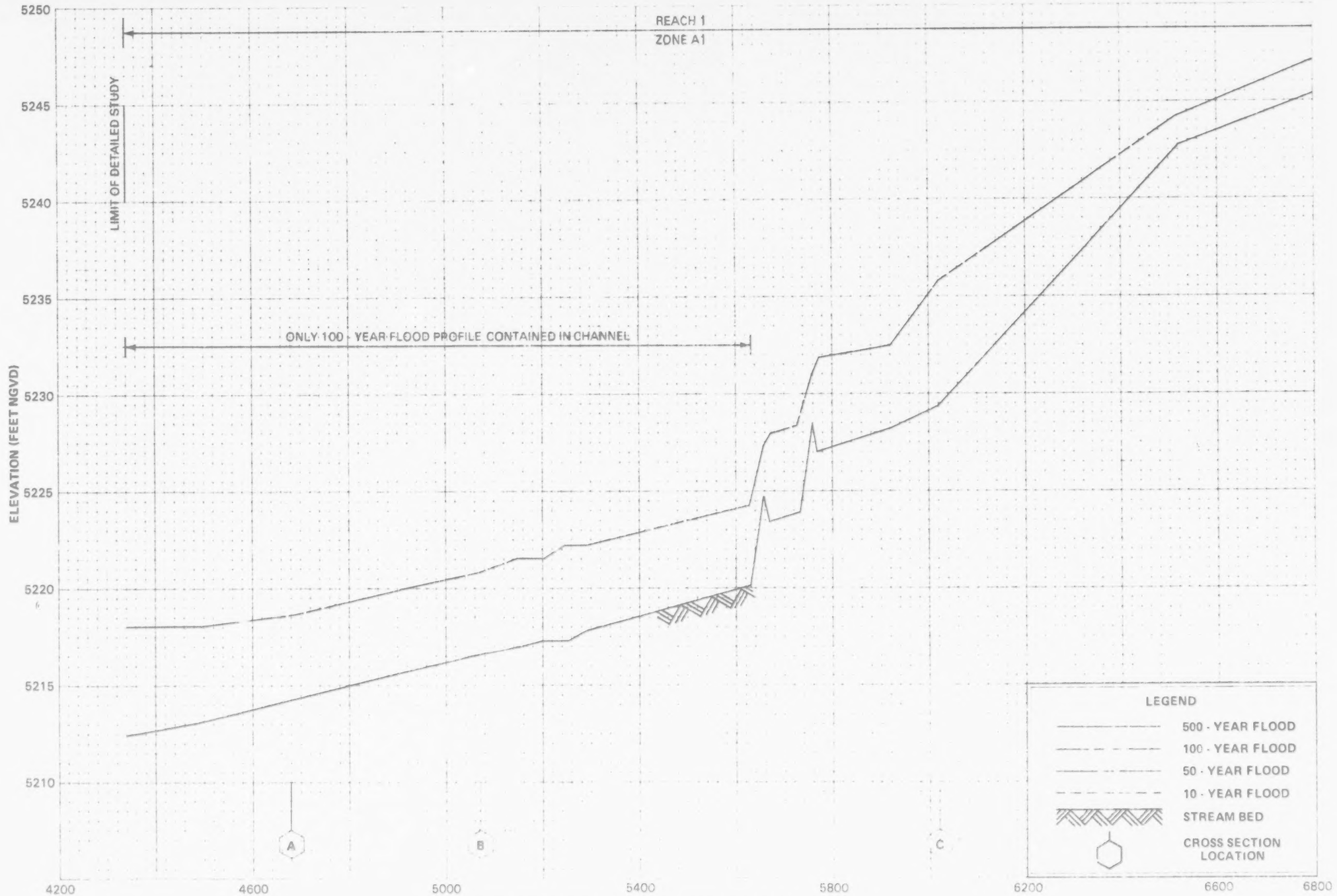
BIG DRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

08P



FLOOD PROFILES

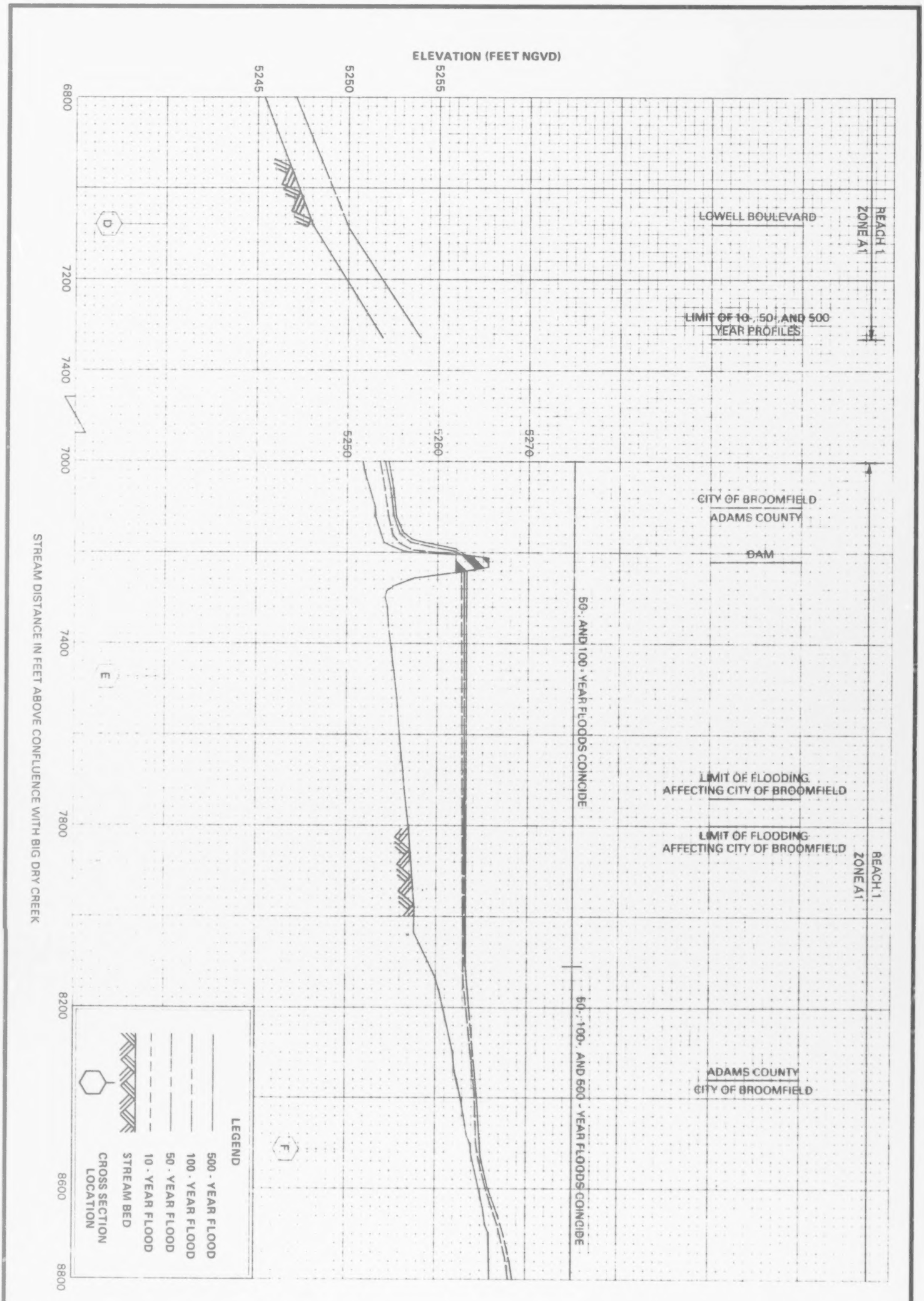
GAY RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

09P



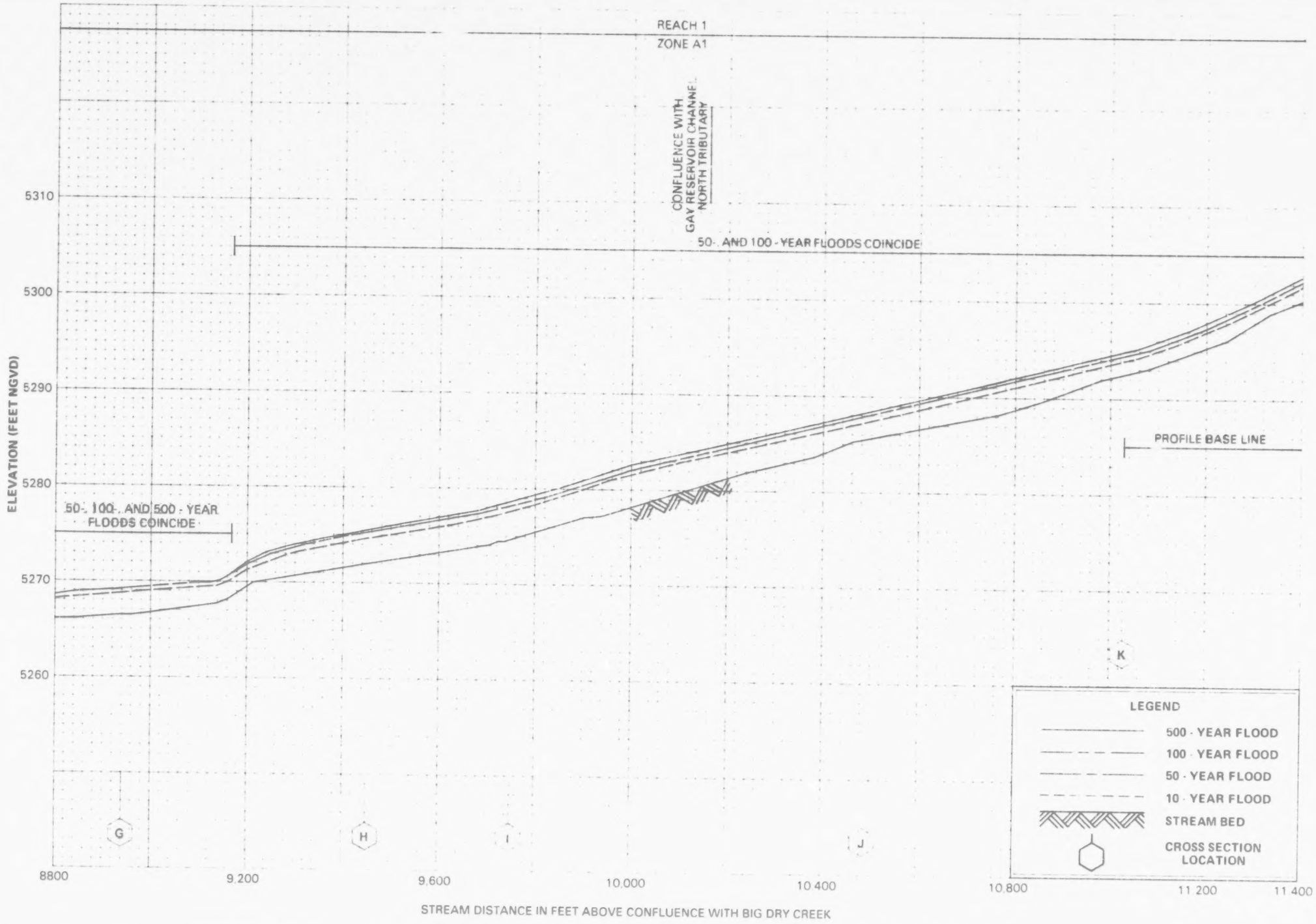
10P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

FLOOD PROFILES

GAY RESERVOIR CHANNEL



FLOOD PROFILES

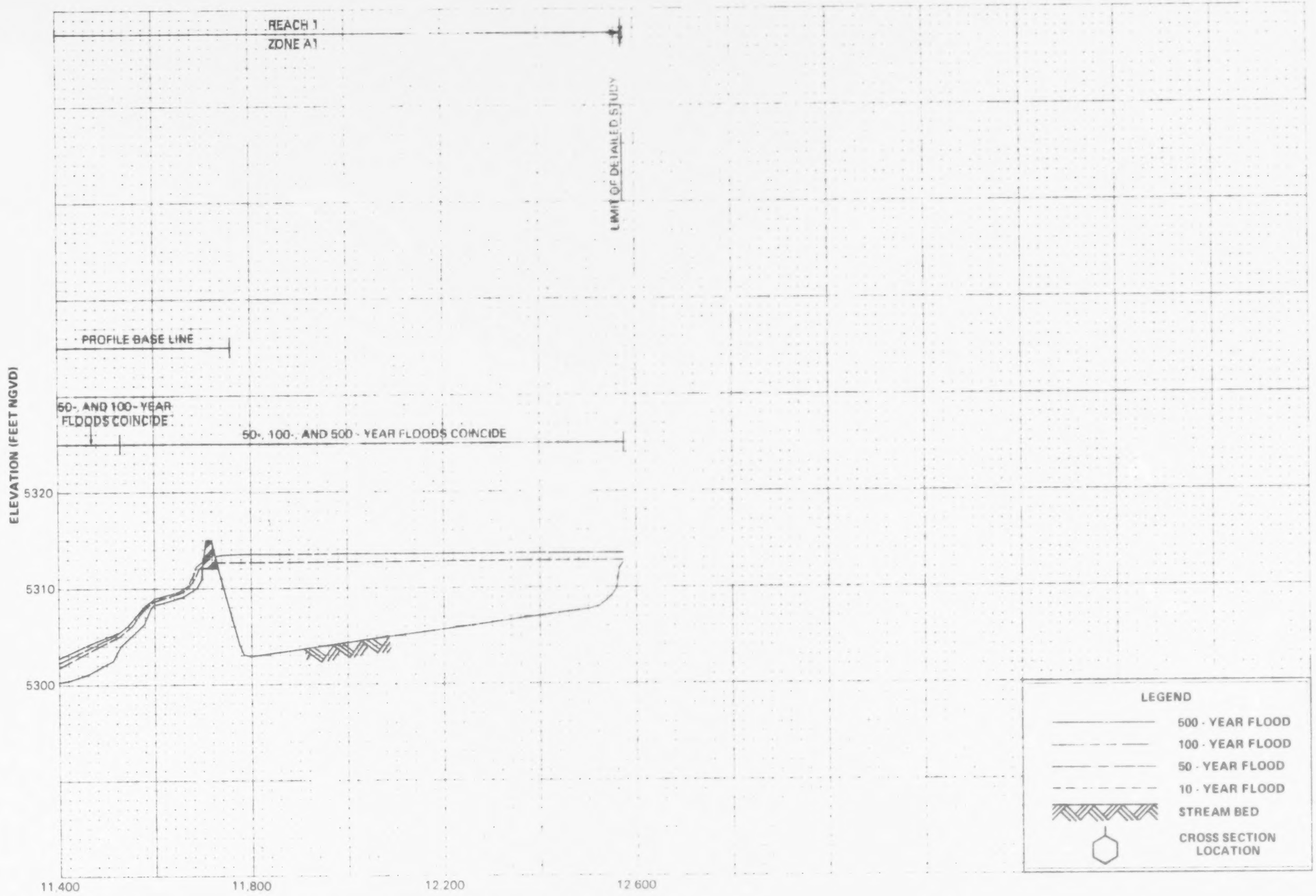
GAY RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

11P



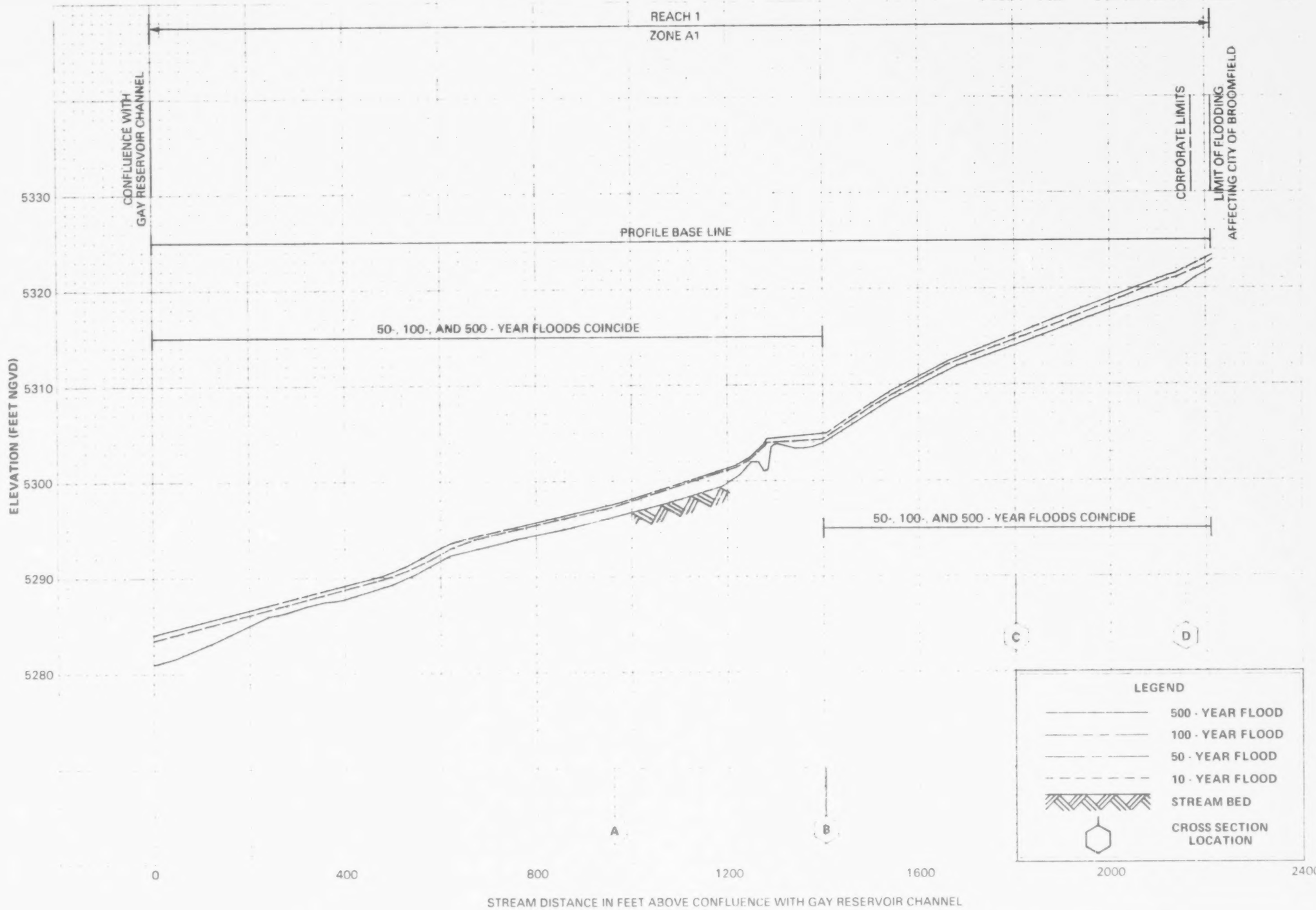
FLOOD PROFILES

GAY RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

12P



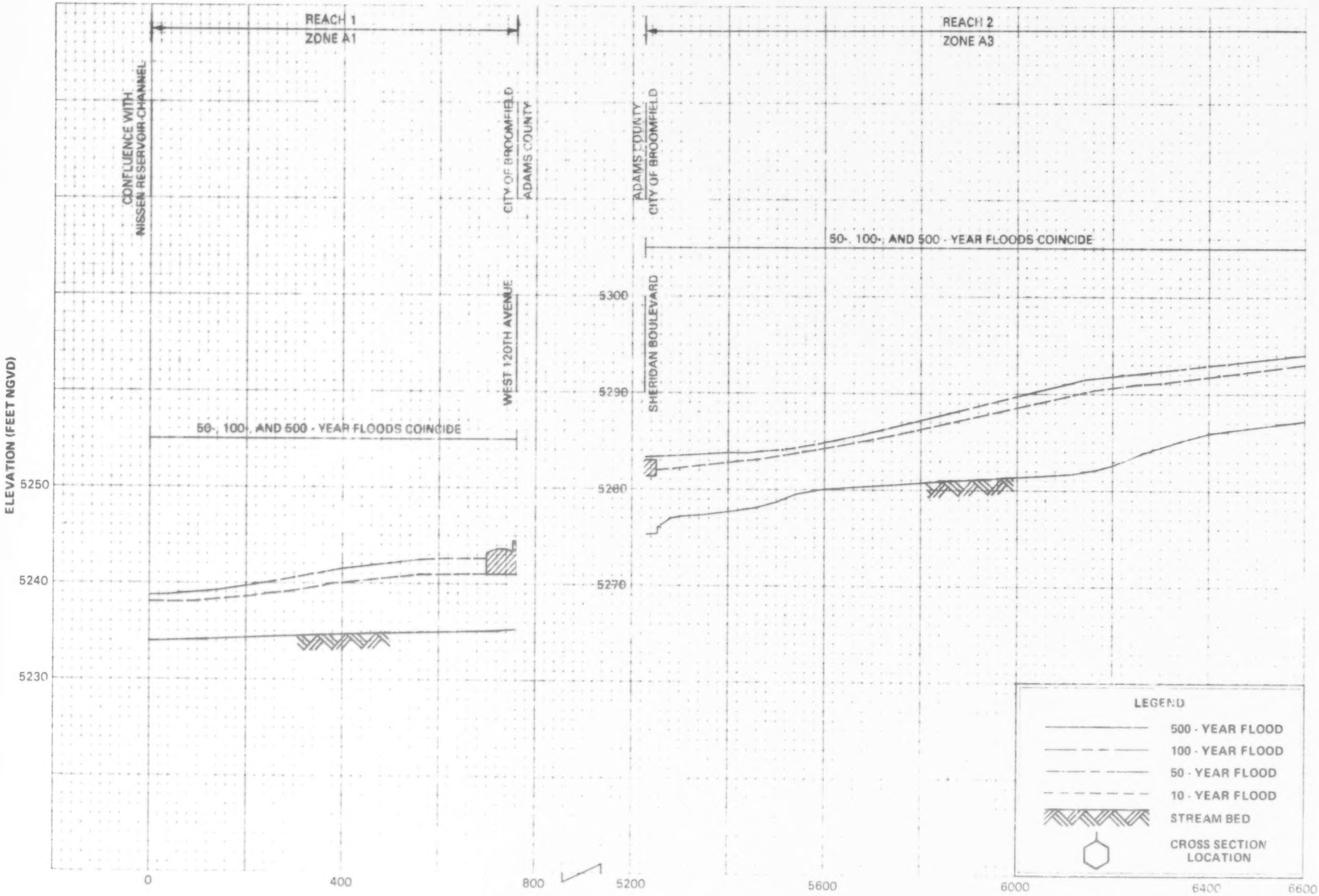
FLOOD PROFILES

GAY RESERVOIR CHANNEL NORTH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

13P



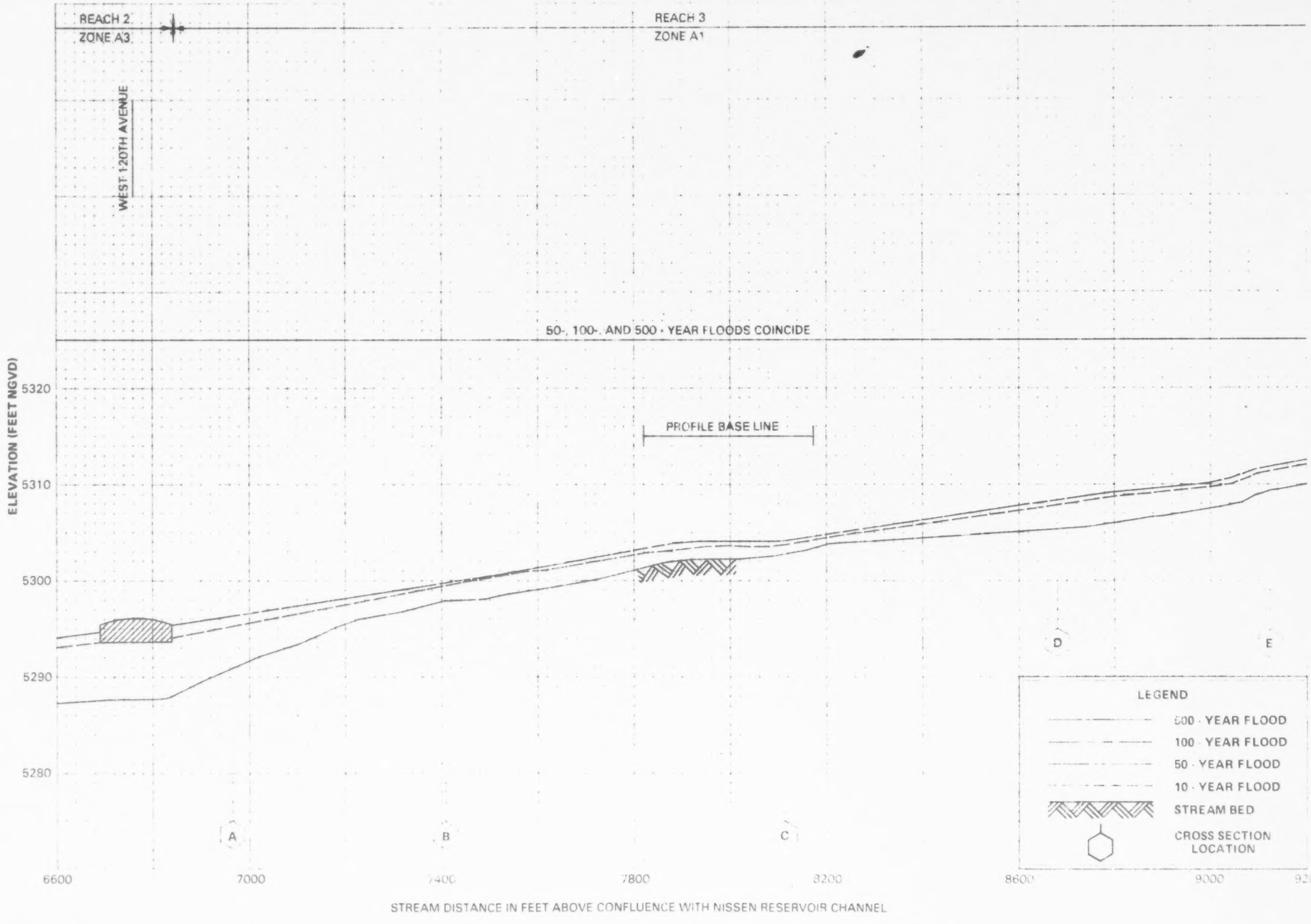
FLOOD PROFILES

CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

14P



FLOOD PROFILES

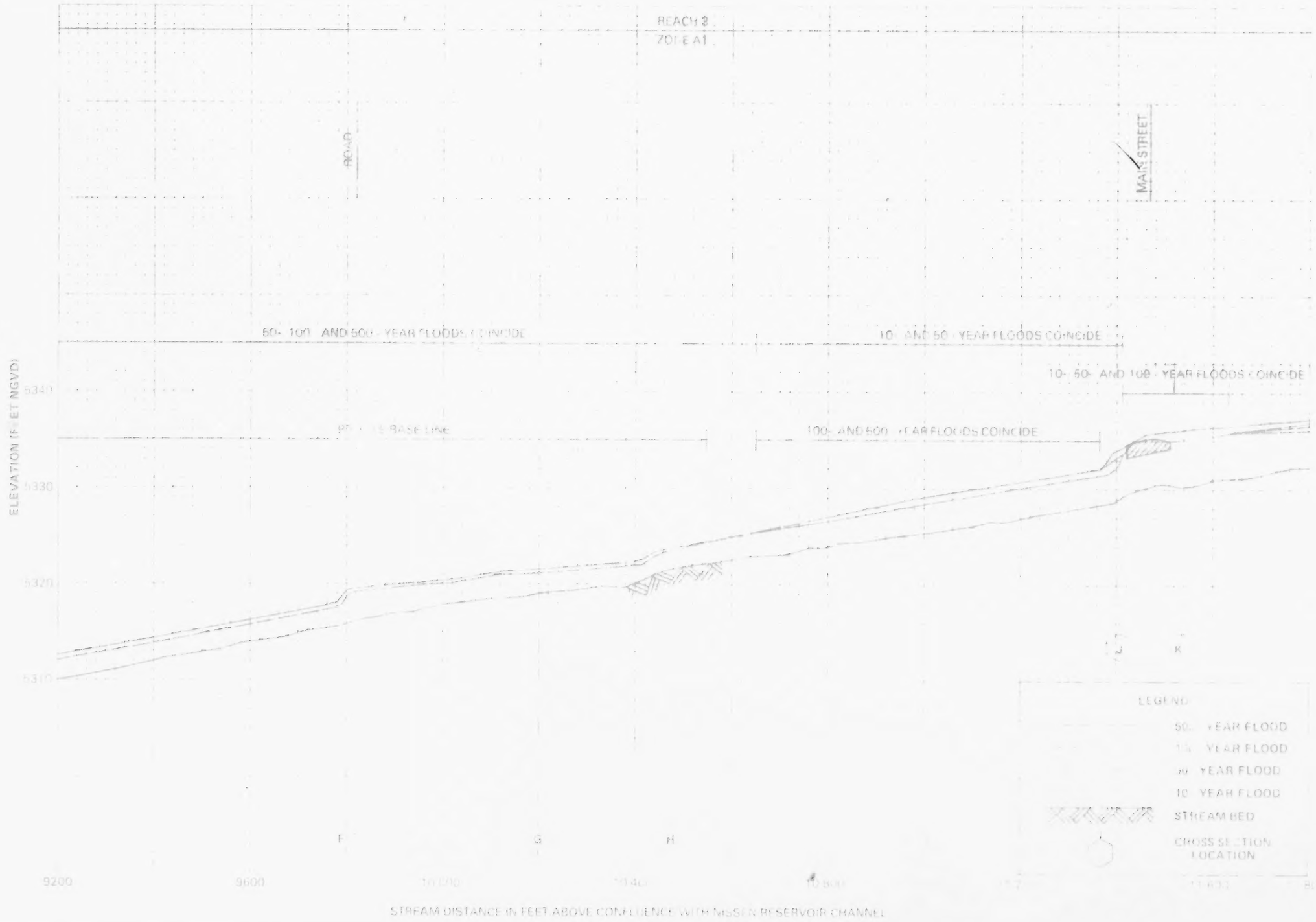
CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

ADAMS, BOULDER AND JEFFERSON COS.

15P



FLOOD PROFILES

CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

JEFFERSON AND BOULDER COUNTIES, CO

16P

REACH 3
ZONE A1

EMERALD STREET

CONFLUENCE WITH CITY PARK CHANNEL SOUTH TRIBUTARY

ELEVATION (FEET NGVD)

5360
5350
5340
5330

L M N O P Q R

11,800 12,200 12,600 13,000 13,400 13,800 14,200 14,400

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH NISSEN RESERVOIR CHANNEL

LEGEND

- 500 - YEAR FLOOD
- 100 - YEAR FLOOD
- 50 - YEAR FLOOD
- 10 - YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

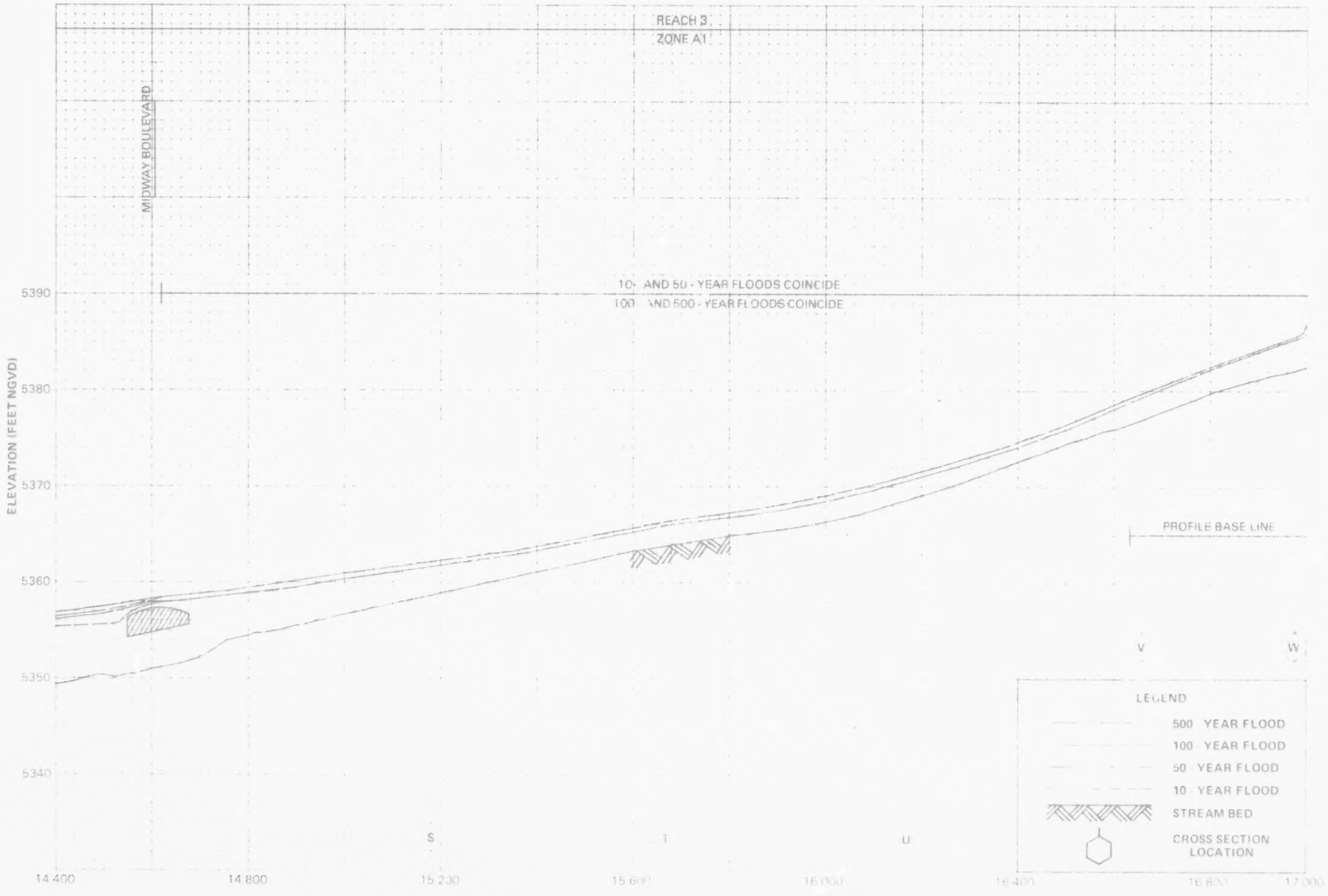
FLOOD PROFILES

CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

17P



FLOOD PROFILES

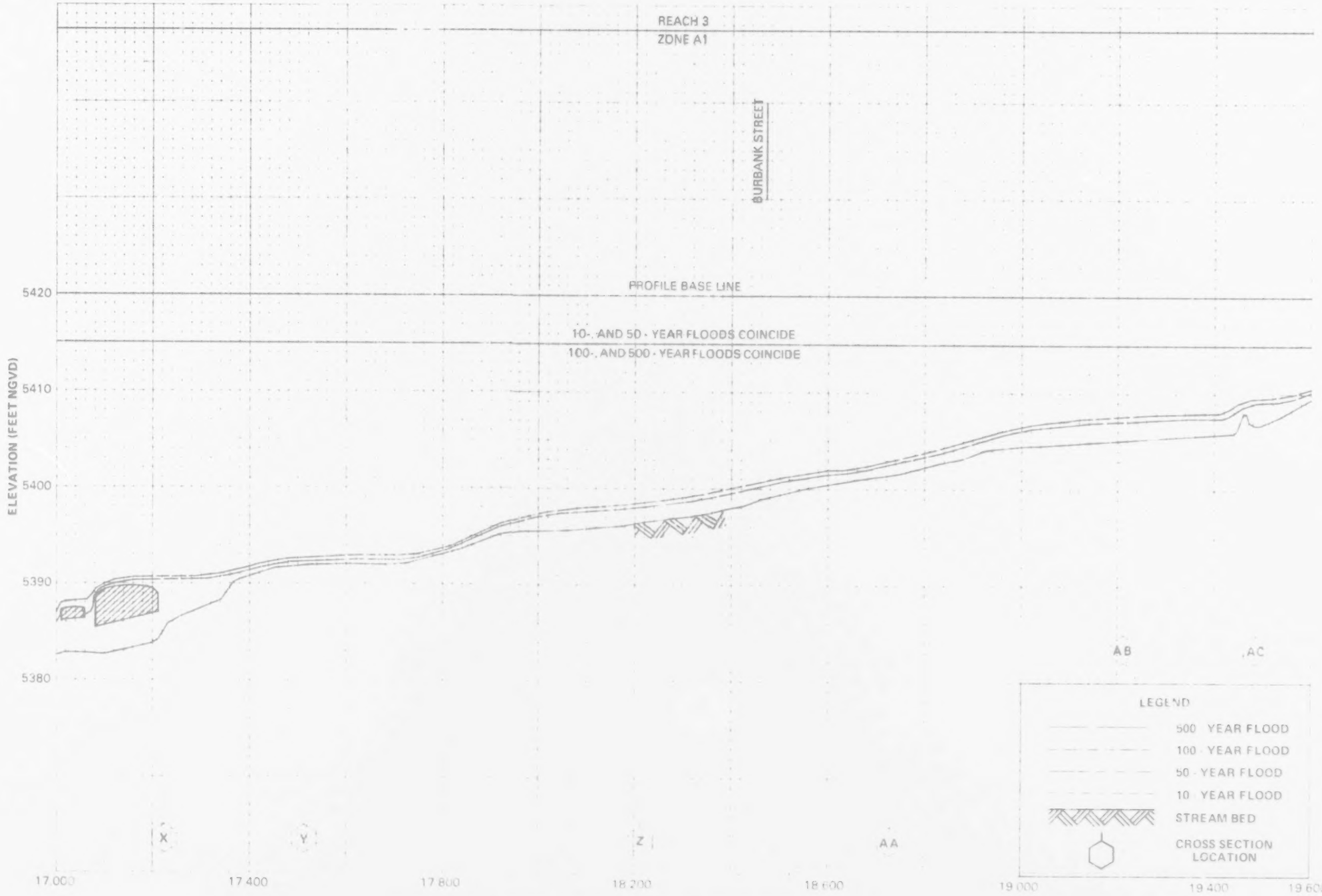
CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

18P

5/



FLOOD PROFILES

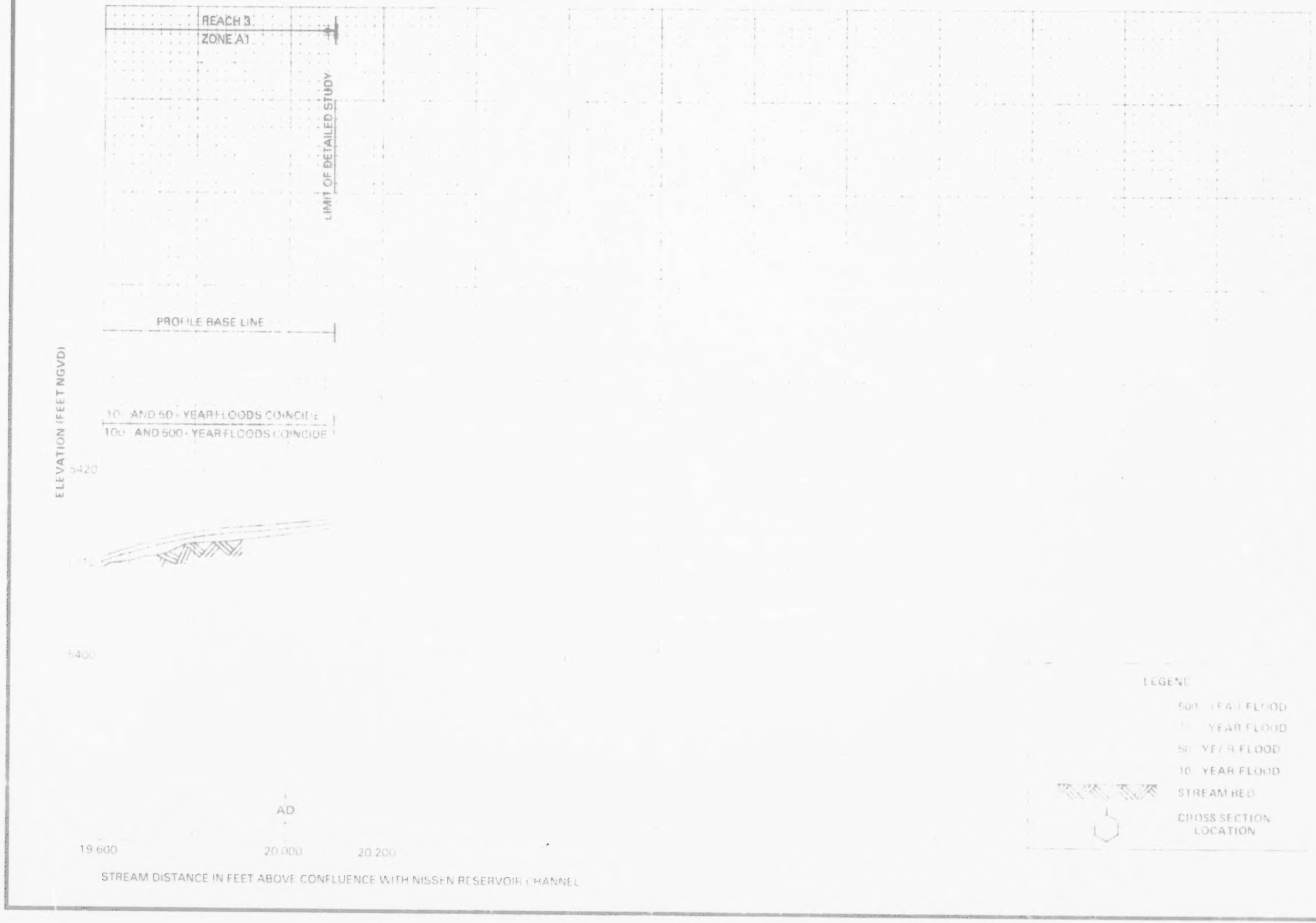
CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

ADAMS, BOULDER AND JEFFERSON COS.

19P



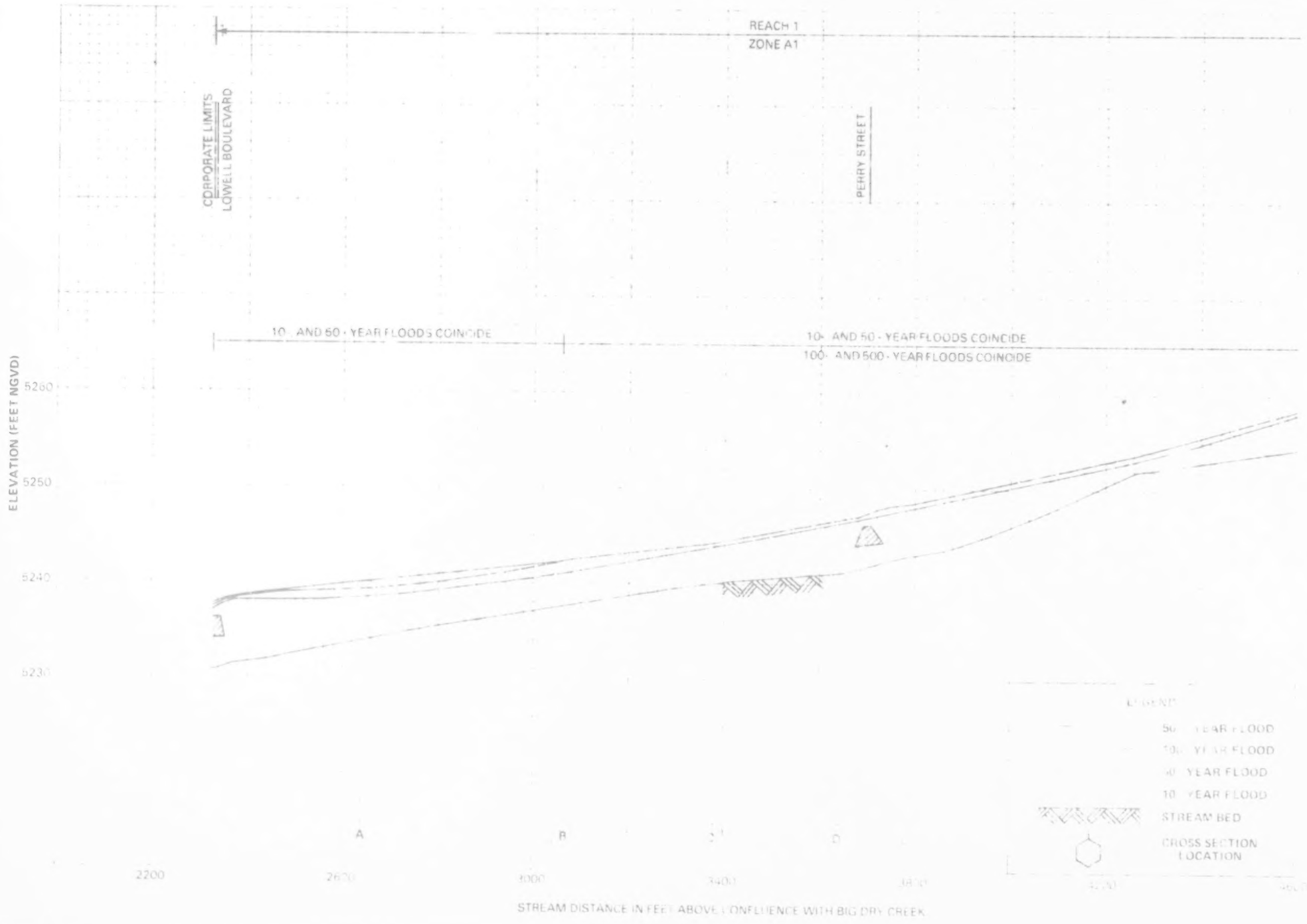
FLOOD PROFILES

CITY PARK CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF PHOCMERED, CO

20P



FLOOD PROFILES

NISSEN RESERVOIR CHANNEL

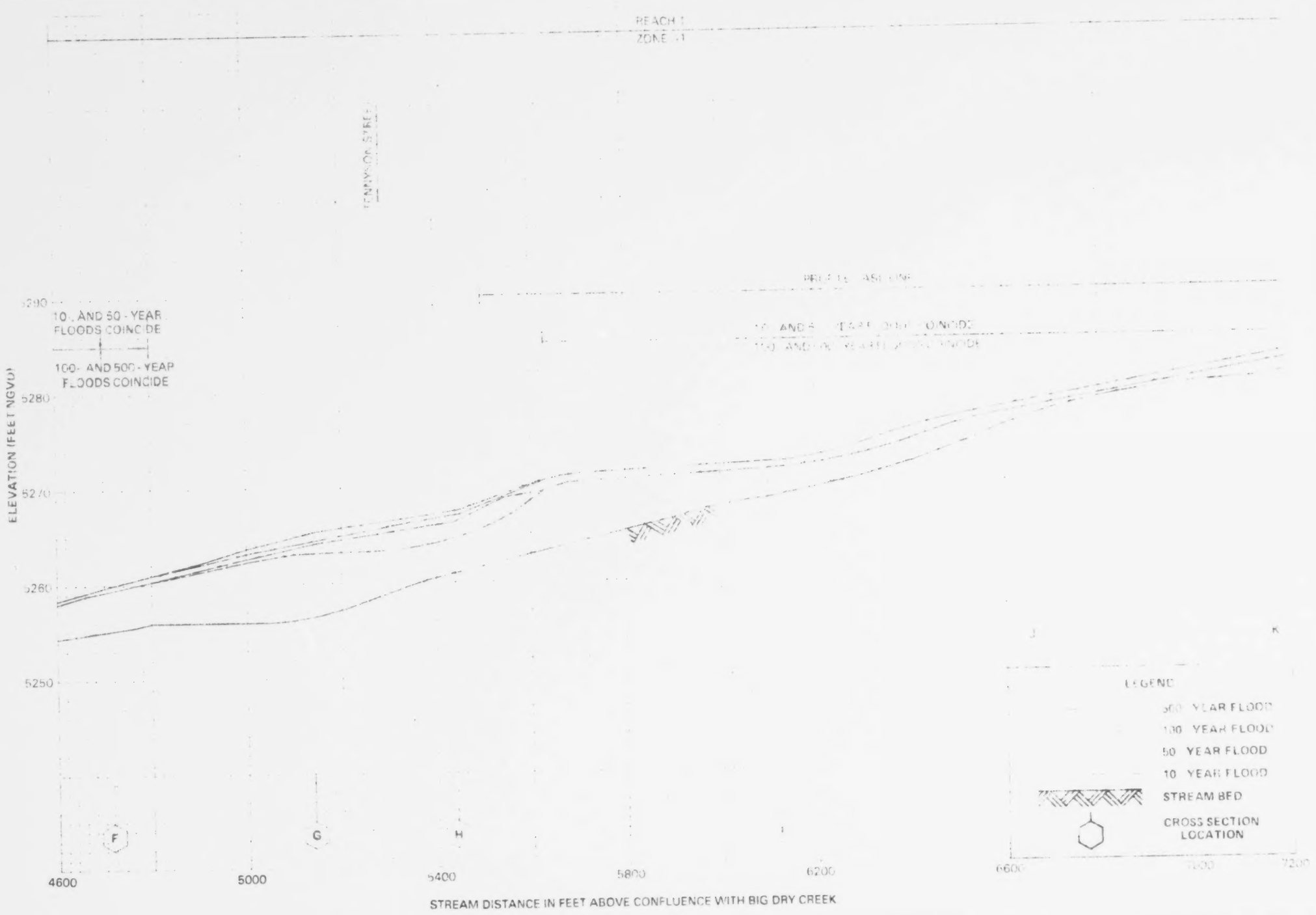
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

BOULDER AND ADAMS COUNTIES

21P

57



FLOOD PROFILES

NISSEN RESERVOIR CHANNEL

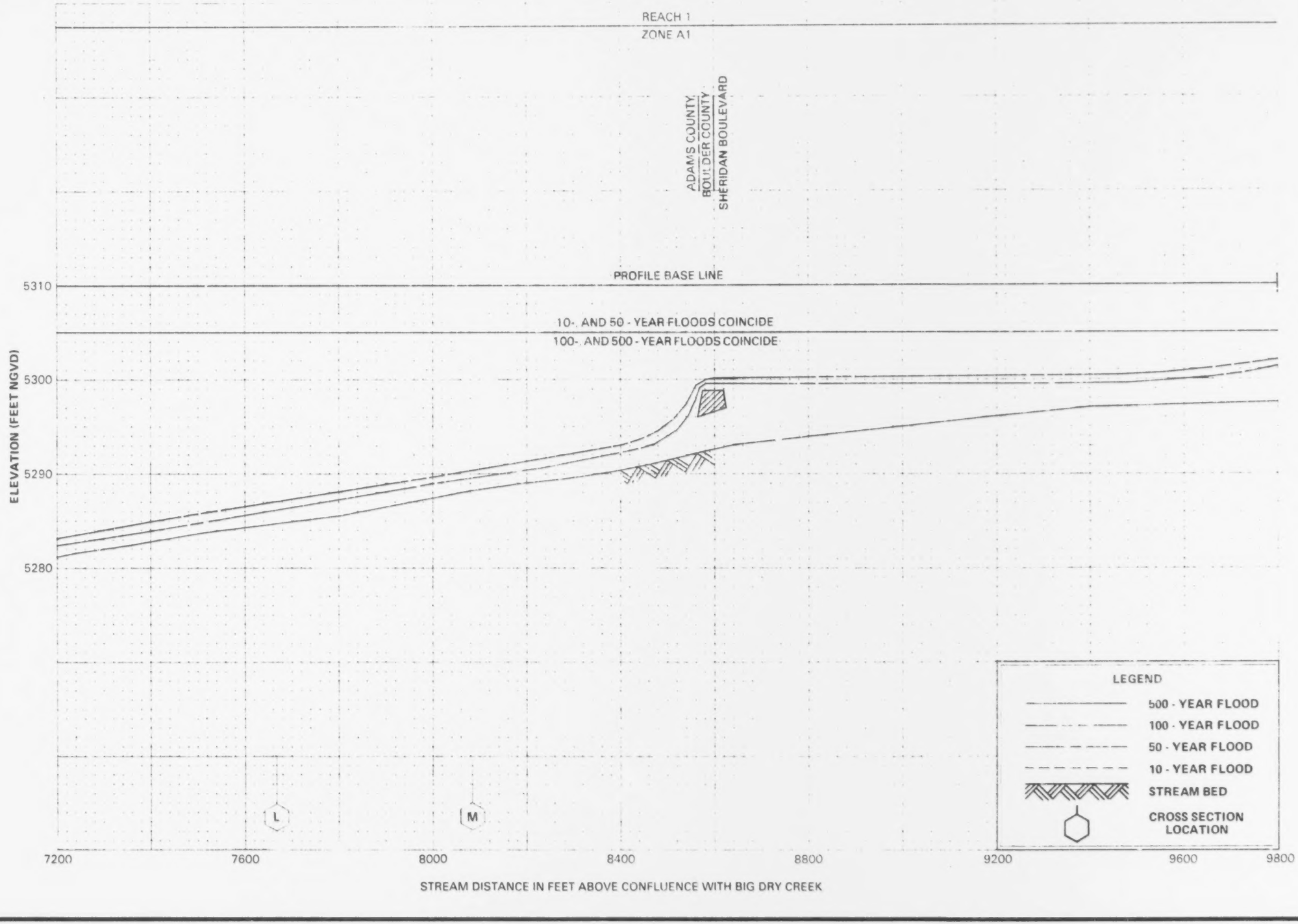
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

ADAMS AND BOULDER COUNTIES, COLORADO

22P

55



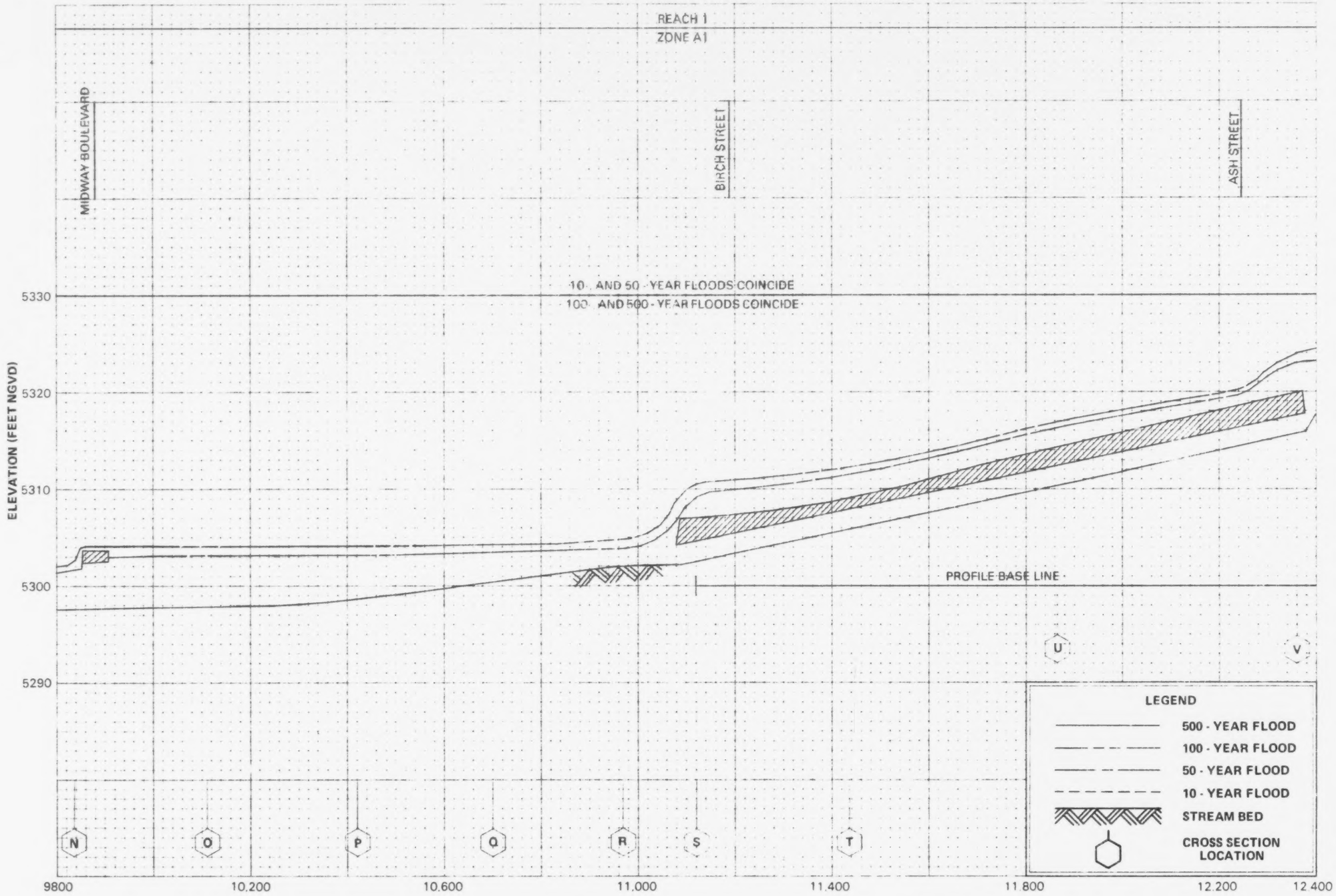
FLOOD PROFILES

NISSEN RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

23P



FLOOD PROFILES

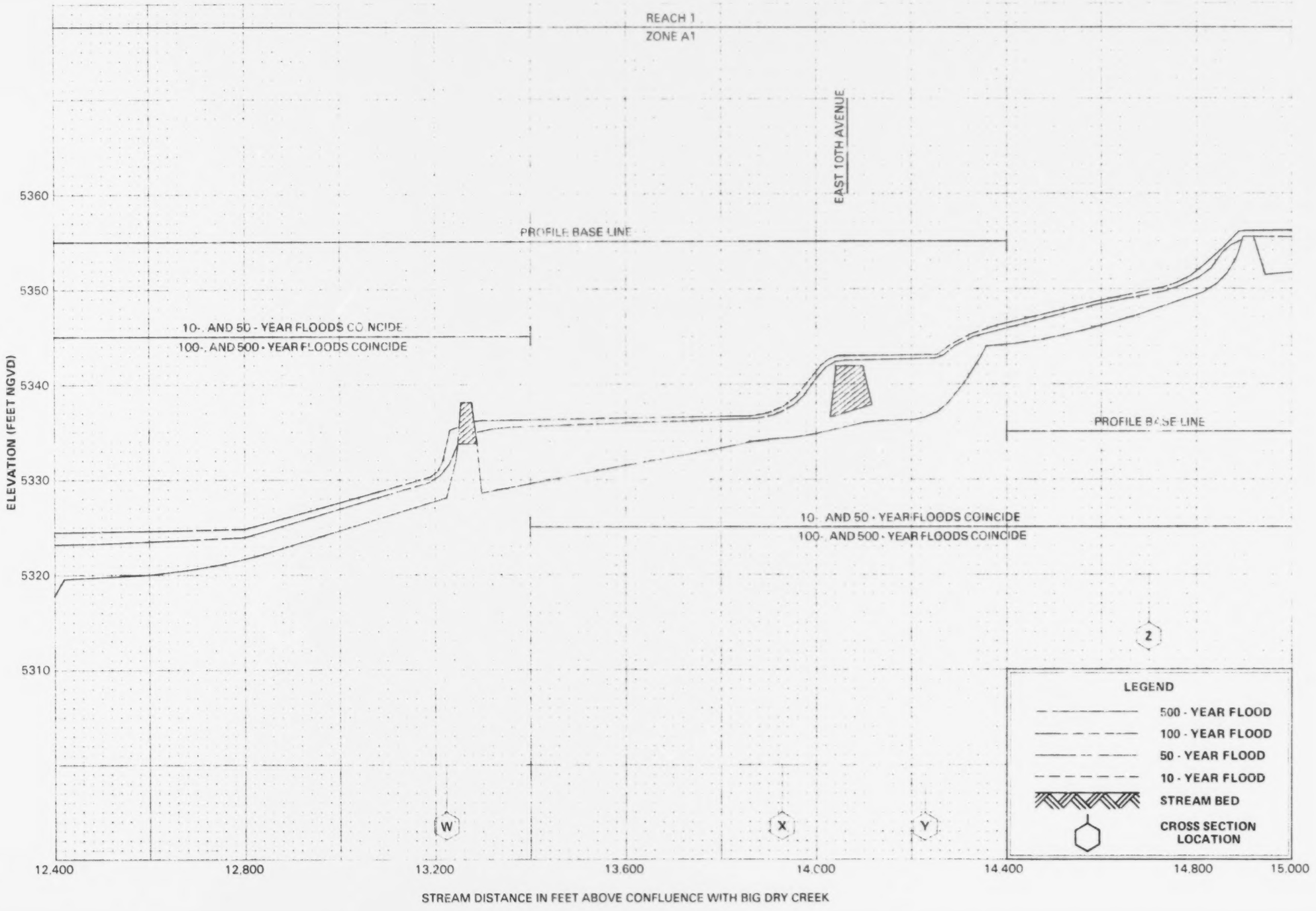
NISSEN RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

24P



FLOOD PROFILES

NISSEN RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

25P

REACH 1
ZONE A1

MAIN STREET
MIRAMONTE BOULEVARD
DAPHNE STREET

PROFILE BASE LINE

10- AND 50-YEAR FLOODS COINCIDE
100- AND 500-YEAR FLOODS COINCIDE

ELEVATION (FEET NGVD)

5390
5380
5370
5360
5350

AA
AB
AC
AD
AE

15,000
15,400
15,800
16,200
16,600
17,000
17,400
17,600

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH BIG DRY CREEK

LEGEND
- 500 - YEAR FLOOD
- 100 - YEAR FLOOD
- 50 - YEAR FLOOD
- 10 - YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

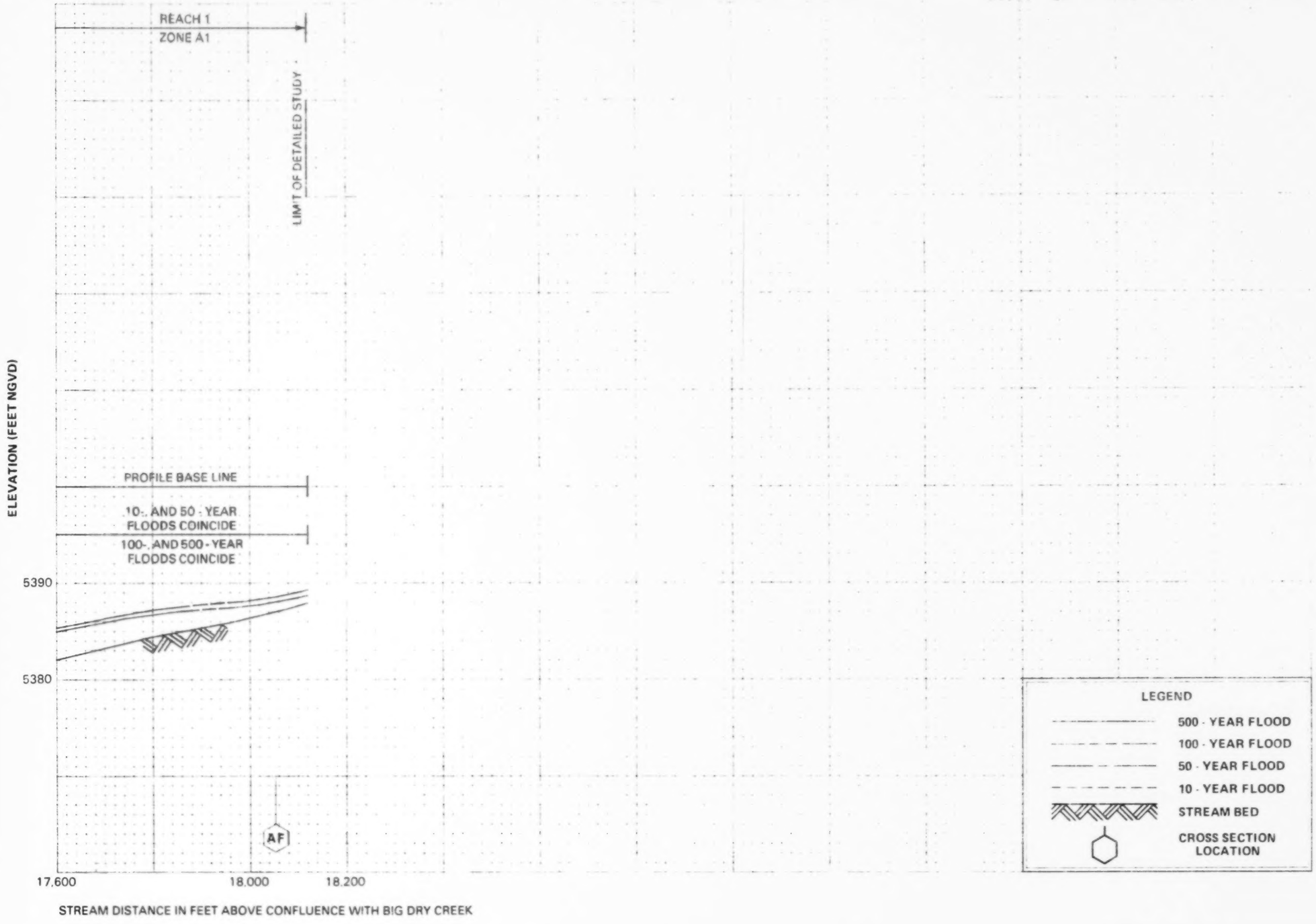
FLOOD PROFILES

NISSEN RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

26P



FLOOD PROFILES

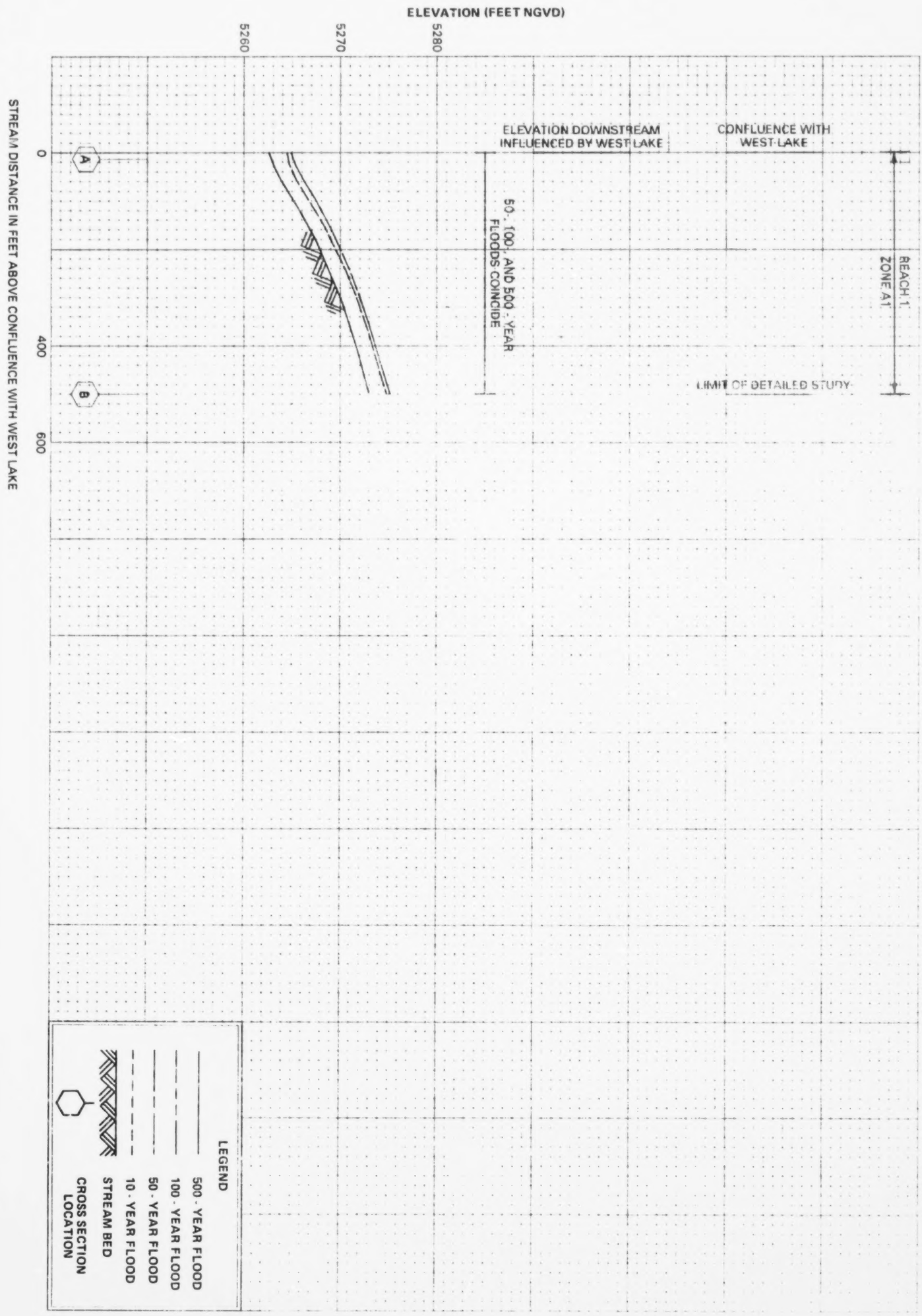
NISSEN RESERVOIR CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO

(ADAMS, BOULDER AND JEFFERSON COS.)

27P



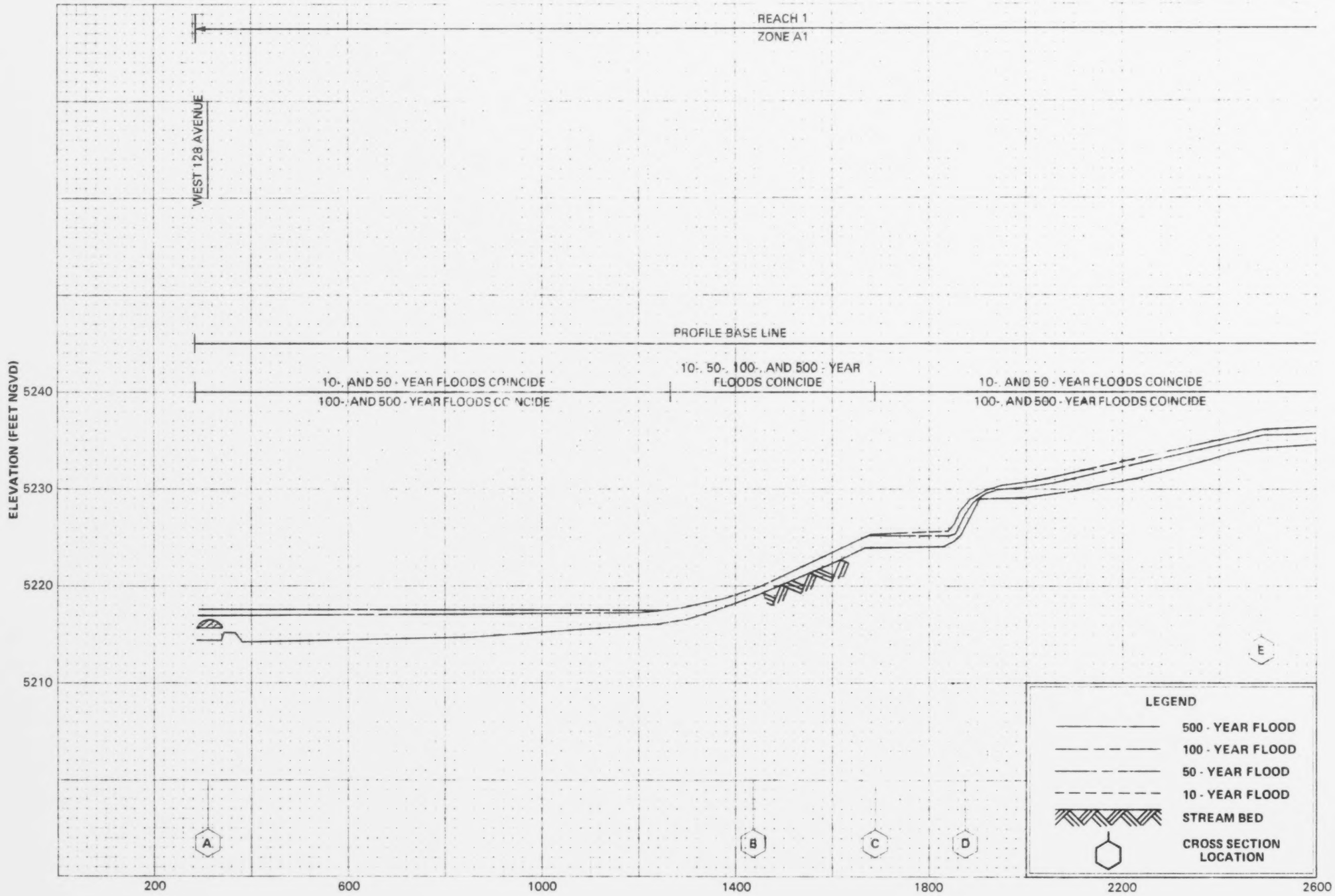
28P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

FLOOD PROFILES

WEST LAKE CHANNEL NORTH TRIBUTARY



FLOOD PROFILES

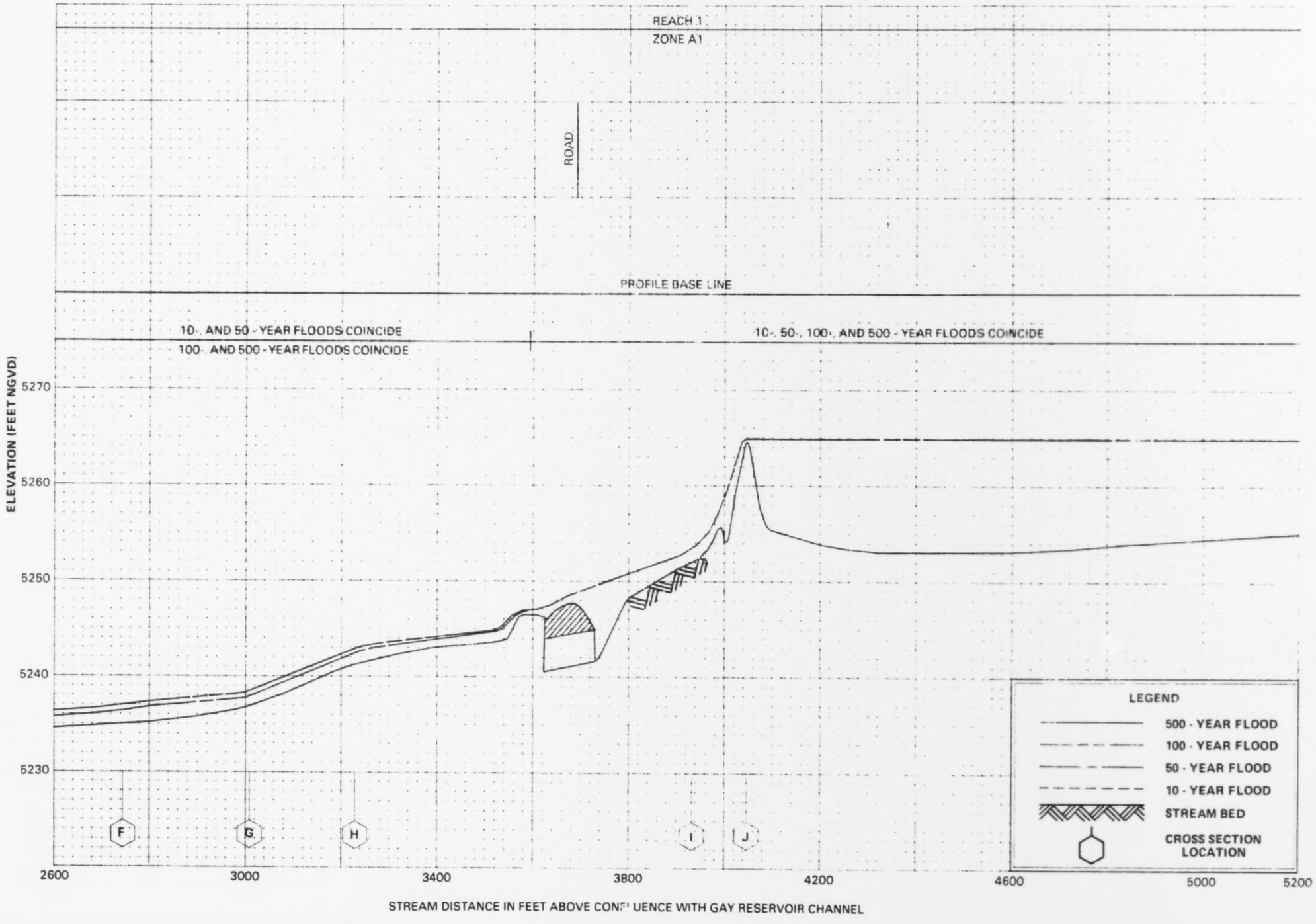
WEST LAKE CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

29P

62



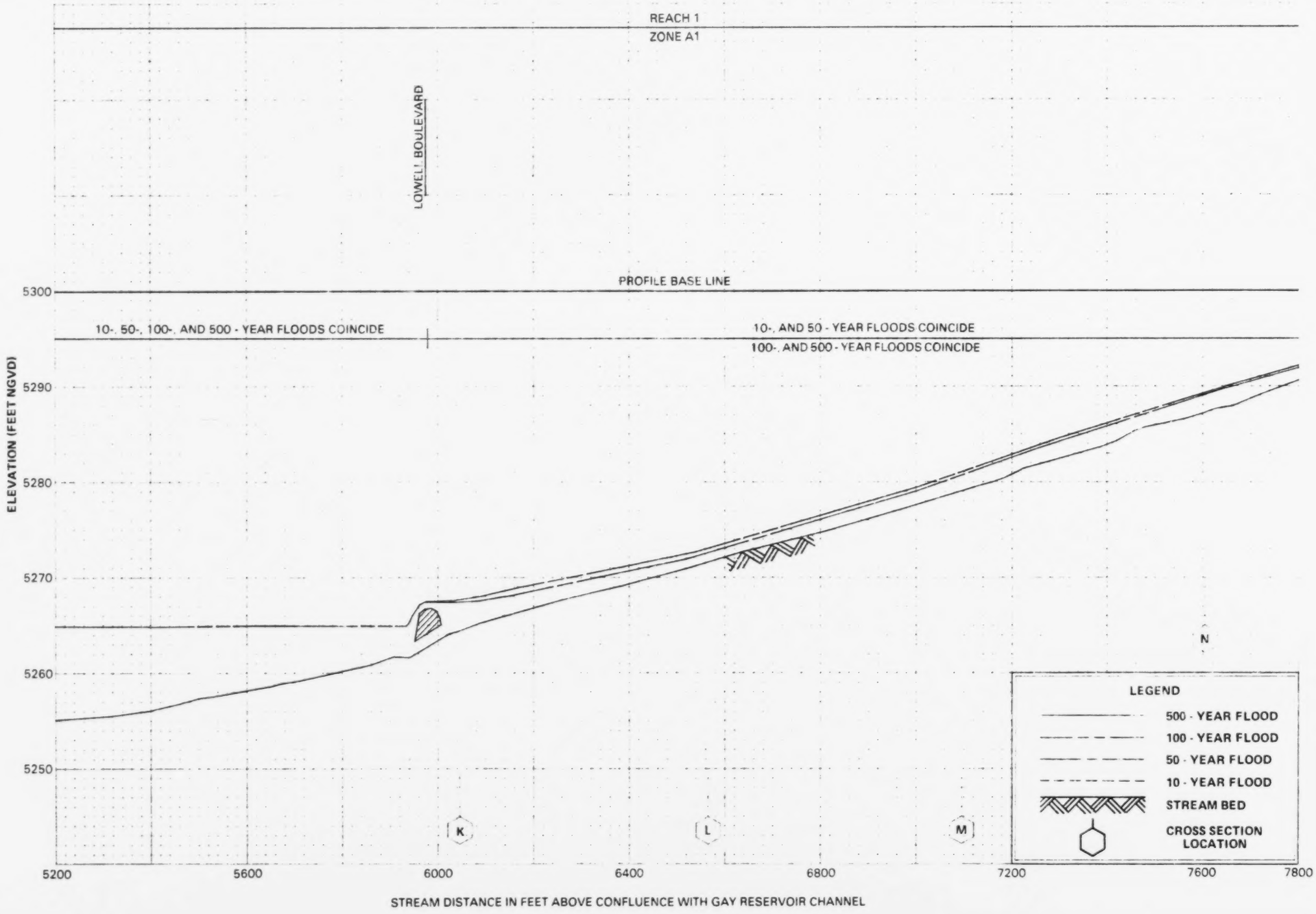
FLOOD PROFILES

WEST LAKE CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

30P



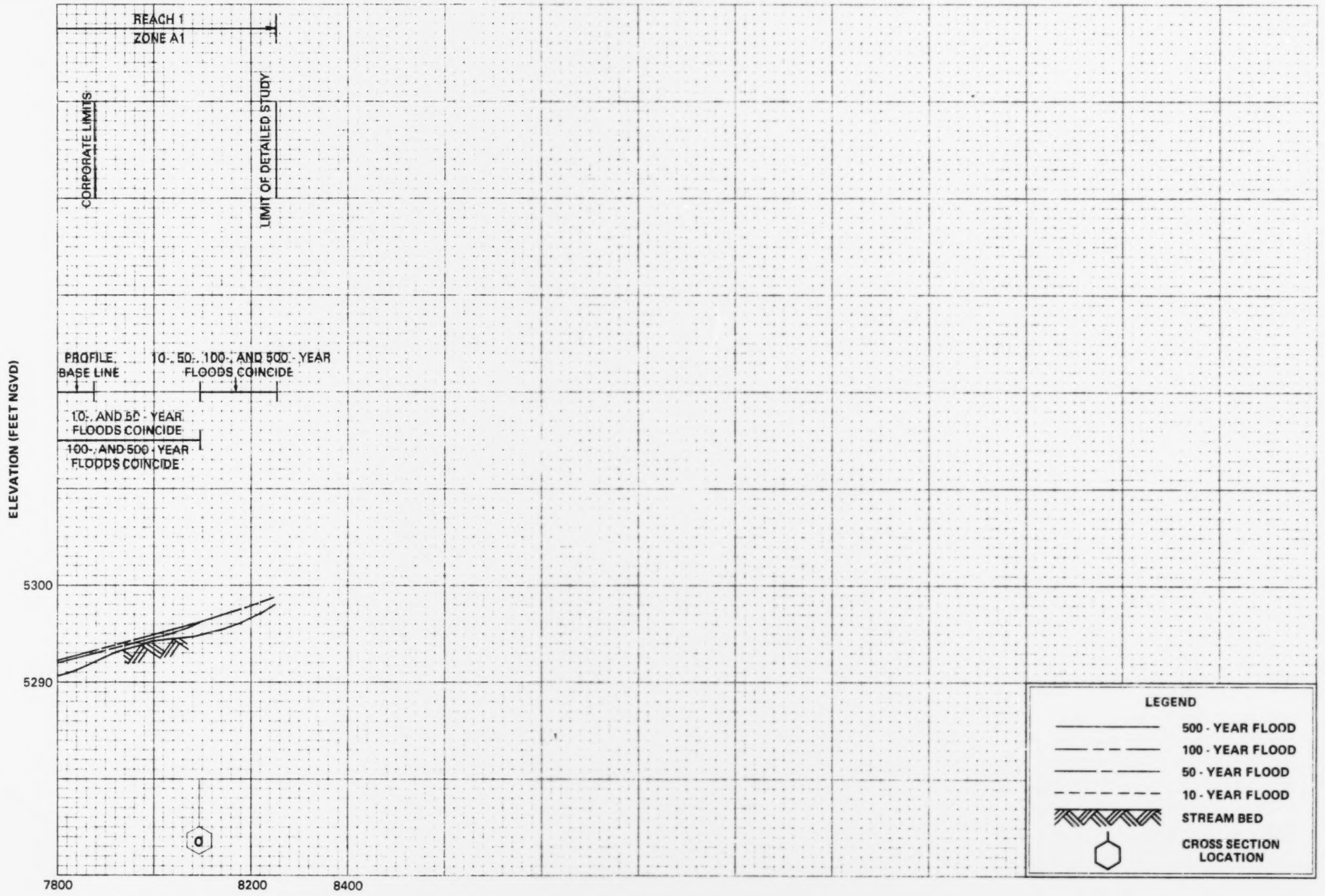
FLOOD PROFILES

WEST LAKE CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

31P



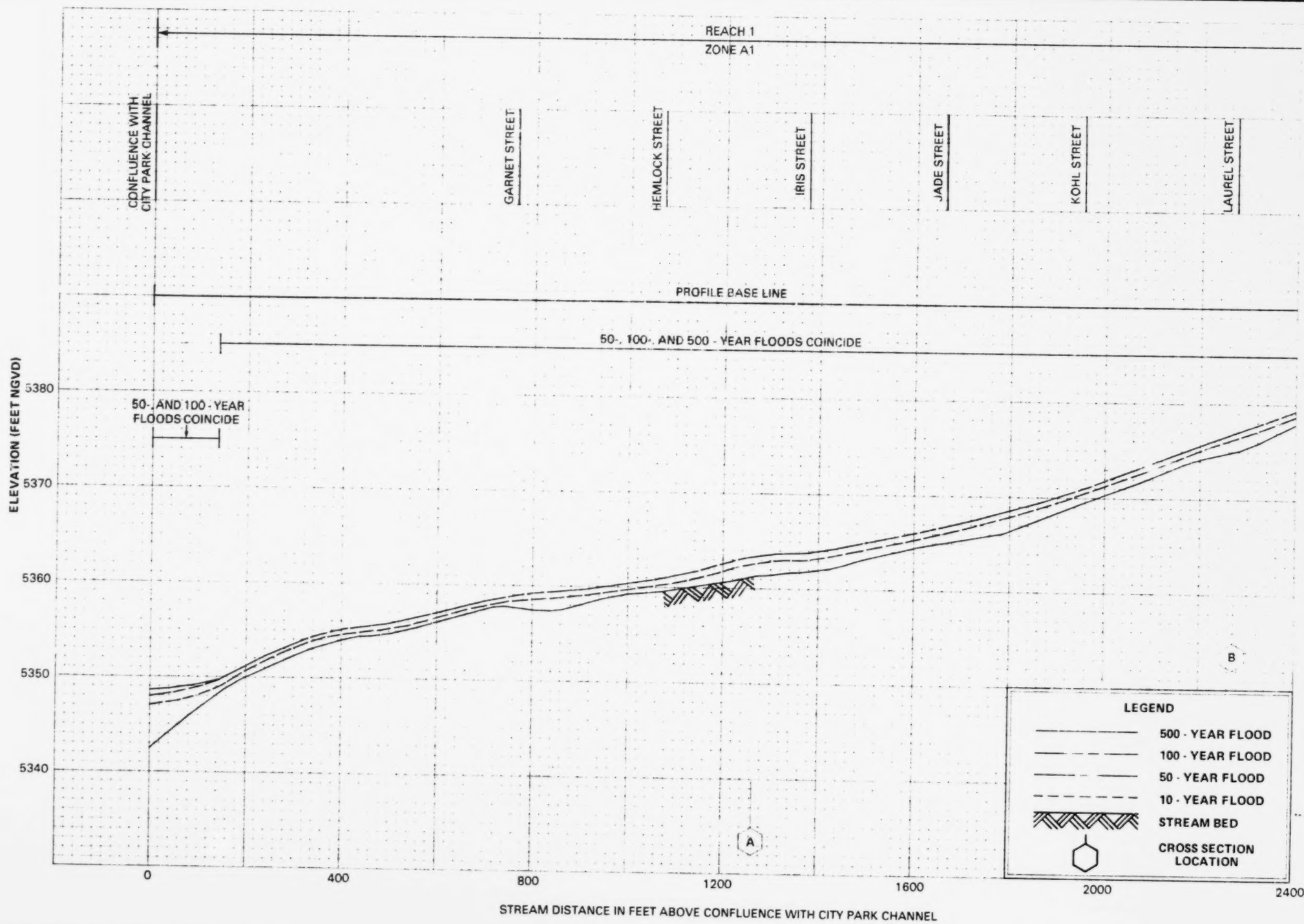
FLOOD PROFILES

WEST LAKE CHANNEL

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

32P



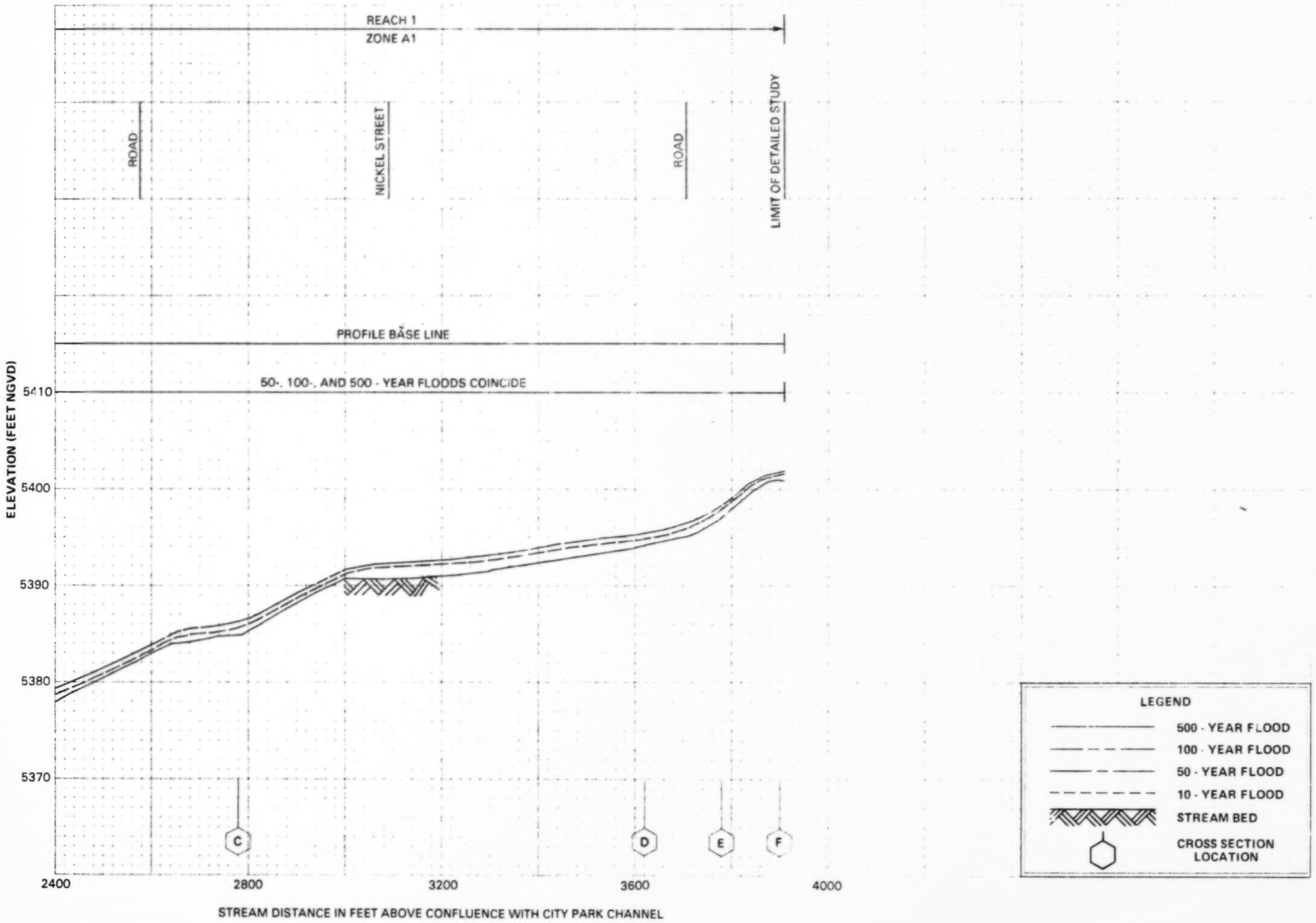
FLOOD PROFILES

CITY PARK CHANNEL SOUTH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

33P



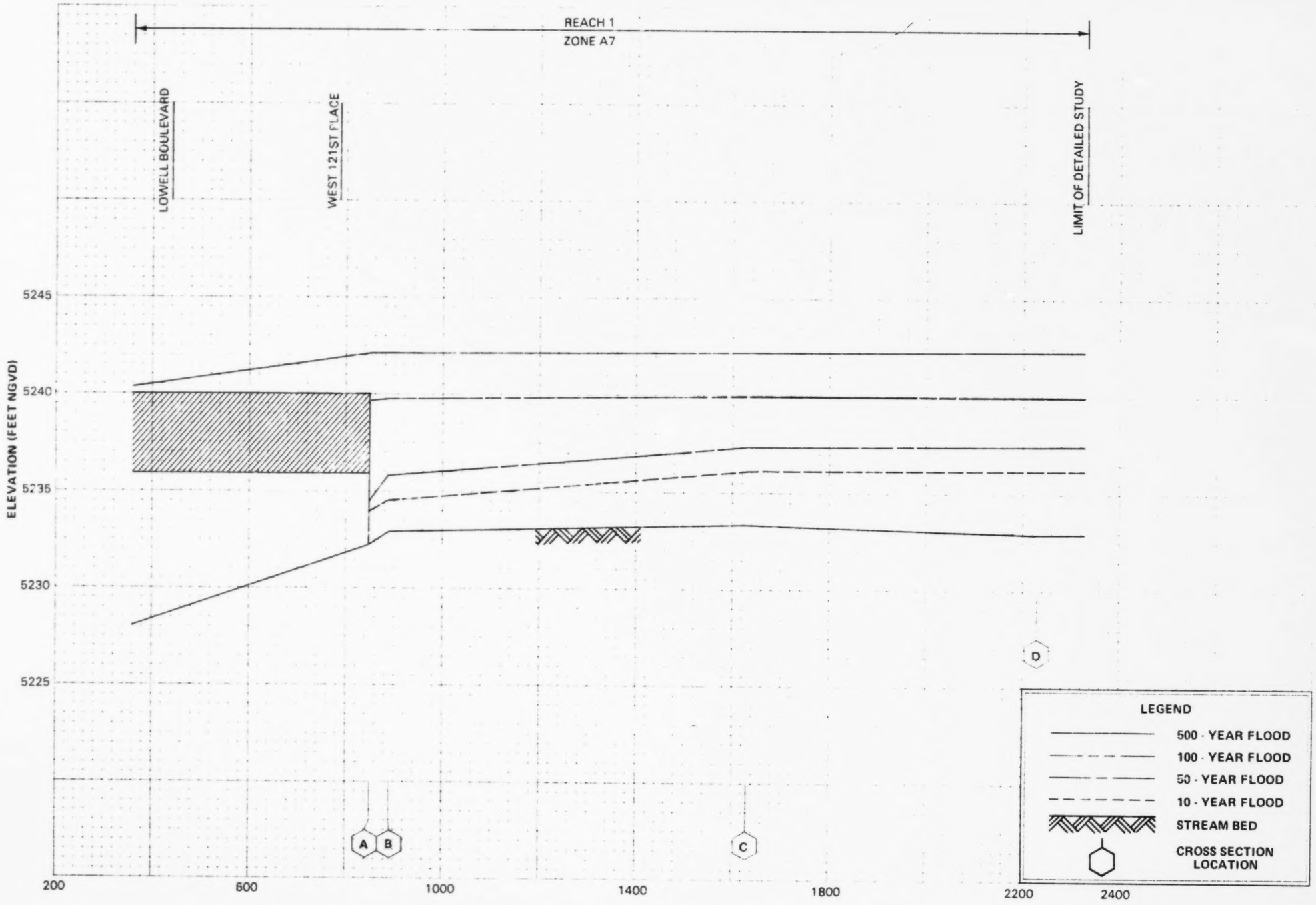
FLOOD PROFILES

CITY PARK CHANNEL SOUTH TRIBUTARY

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

34P



FLOOD PROFILES

BRANDYWINE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BROOMFIELD, CO
(ADAMS, BOULDER AND JEFFERSON COS.)

35P